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ABSTRACT

This publication contains 22 activities that have been developed to help teachers and students become more aware of, appreciate, and understand the food and fiber production system and its role in the economy and society. Teachers are intended to select activities appropriate to their students' abilities and interests. Each activity contains the following: suggested grade level; subject area(s); background information pertaining to activity; resource addresses to obtain more information pertaining to activity; suggested procedures to use with the materials; additional activities to reinforce or supplement; reproducible worksheets and activity sheets for student use; and answer keys for immediate feedback. Contents include Alfalfa to Zucchini; All About Popcorn; Cattle Chatter; Corny Words; Do You Need the Soil?; A Farm Animal from Wheat; From Hen to Home; Getting to the Core; Grain Sorghum; Liquid Measurement Cow; The Living Soil; The Not So Simple Spud; Oh Shucks; Our Farm Friends; Pig Math; Planting Potatoes and Other Plants; Seeds, Seeds, Seeds; Sheep are Ewe-nique; Spelling Milk Pails; Soybean Math; The Wheat Game; and That Wonderful Beef. A final folder contains a listing of library books and provides resource materials for teacher use. (YLB)

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Nebraska's Ag in the Classroom



Learning Activities

Published by
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In cooperation with
The Institute of Agriculture & Natural
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The Nebraska Department of Education

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NEBRASKA DEPARTMENT OF EDUCATION

301 Centennial Mall South Box 94987
Lincoln, Nebraska 68509 Telephone: (402) 471-2295

Dear Teacher:

This book of activities represents a joint effort by classroom teachers such as yourselves, and the Departments of Agriculture and Education. It is the result of a growing realization that we owe our youngsters some background and some current information about our agricultural heritage and responsibilities. Problems of water and soil usage, as well as those of production and distribution, await solutions, many of which will be generated by those who are in school today. We hope these suggestions will be helpful to you.

Sincerely,

Joe E. Lutjeharms

JOE E. LUTJEHARMS

Commissioner of Education

FOREWORD

This publication has been developed to help teachers and students become more aware, appreciate, and understand the food and fiber production system and its role in our economy and society.

The Nebraska Ag in the Classroom Program can also provide additional teacher training and educational materials via professional in-service, teacher tours, and curriculum workshops. For more information, please contact...Nebraska Ag in the Classroom Program, Curriculum Coordinator, P.O. Box 94947, Lincoln, NE 68509, (402) 471-4876.

Teachers should select activities in this publication that are appropriate to their students' abilities and interests. As you select activities that will supplement your existing curriculum, we recommend you give students as many first-hand experiences as possible. With a stack of old farm magazines, small jars of different grains, containers of soil, toy tractors and implements, many fascinating learning centers can be constructed. There are many resources in your community for field trips, guest speakers, and educational materials. The local agri-businesses, grain elevators, implement dealers, and producers will be able to provide hands-on experiences for students.

Each activity has an individual folder which contains the following:

1. Suggested grade level; however, each can be revised to fit any grade level.
2. Background information pertaining to that activity.
3. Resource addresses to obtain more information pertaining to each activity.
4. Suggested procedures to use with the materials.
5. Additional activities to reinforce or supplement.
6. Reproducible worksheets and activity sheets for student use.
7. Answer keys for easy and immediate feedback.

We hope that you find this notebook useful, beneficial, and an enjoyable resource, one which will help you teach concepts of the food and fiber production system and how that system affects all our lives.

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Julie Bergman
Melanie Collins
Jayne Flory

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Debra Marquart
Barb McCallum

Carolyn Pointer
Kathy Schellpeper
Donna Trojanowski

Organizations providing either materials or permission for reproduction of materials include:

American Egg Board
Country Kids Magazine
Creative Ways to Cultivate Agriculture in the Classroom,
North Dakota
Dairy Council of Central States
Farm in the School, Illinois Farm Bureau
Metropolitan Education Program Agency — Project Plum
National Livestock and Meat Board — Pork Industry Group
Nebraska Beef Development Board
Nebraska Department of Roads
Protecting Agricultural Land, Minnesota's Ag-Stravaganza,
Governor's Council on Rural Development
The Growing Classroom, Life Lab Science Program, Office of Education,
Santa Cruz County, California
The Potato Board

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Nebraska Agri-Women
Nebraska Association of Resource Districts and all 24 Natural Resource Districts
Nebraska Corn Development, Utilization and Marketing Board
Nebraska Council on Public Relations for Agriculture
Nebraska Farm Bureau Federation
Nebraska Potato Development Board
Nebraska Poultry Industries
Nebraska Grain Sorghum Development, Utilization and Marketing Board
Nebraska Soybean Development, Utilization and Marketing Board

Ag in the Classroom --- Alfalfa to Zucchini Program

Subject Area: Social Studies

Objective: The student will:

1. gain a knowledge of the diversity of Nebraska's agricultural products.
2. review alphabetical order, spelling, and vocabulary.
3. develop map reading skills.
4. develop critical thinking.

Suggested

Grade Level: 4 - 6, but can be modified to any grade level.

Background:

This activity stresses the variety of agricultural products grown and produced throughout the state of Nebraska. The state encompasses the Corn Belt farming in the east, beef cattle production in the sandhills, and Great Plains wheat production in the west, with irrigation increasing the diversity and volume of crop production.

Resources:

1. Nebraska Agriculture; published by the Nebraska Department of Agriculture.
2. Agricultural Atlas of Nebraska; University of Nebraska Press, Project Director; Merlin P. Lawson, 1977.
3. Nebraska Statistical Handbook (Current Year); Nebraska Department of Economic Development.

Materials:

1. Worksheet
2. Answer Key A and B.
3. A large road map, enclosed in "Library Books/Resource materials" folder in the this notebook

Procedure:

1. Have a class discussion on the agricultural products of Nebraska.
2. After identification of the products, categorize the products into edible or unedible, crops or livestock, etc.
3. Identify the counties in Nebraska and the location of each product on the map, either through class discussion or individual worksheets.
4. Have a discussion of the weather, soil, water, and the effects these elements have on the selection of crops grown in the different regions of Nebraska.

Additional Activities:**Cooking Experience - Alfalfa Sprouts**

Use sprouts as a vegetable, in salads and on sandwiches.
For sprouting follow these easy directions:



Use a jar which fits a canning ring and seal; remove the seal and replace it with nylon mesh, plastic screening or cheese cloth.



Measure in two tablespoons of raw, whole alfalfa seeds and cover with three times as much water.



Soak for eight hours (overnight is good).

Pour off the water (save for soups if you wish), rinse the sprouts and drain (drain completely to prevent mold).



Place in a warm dark place.

Rinse and drain two, three or four times daily. The more you rinse the sprouts, the larger and crunchier they become. After the third day, the hulls will float to the top when being rinsed, and should be scooped off.

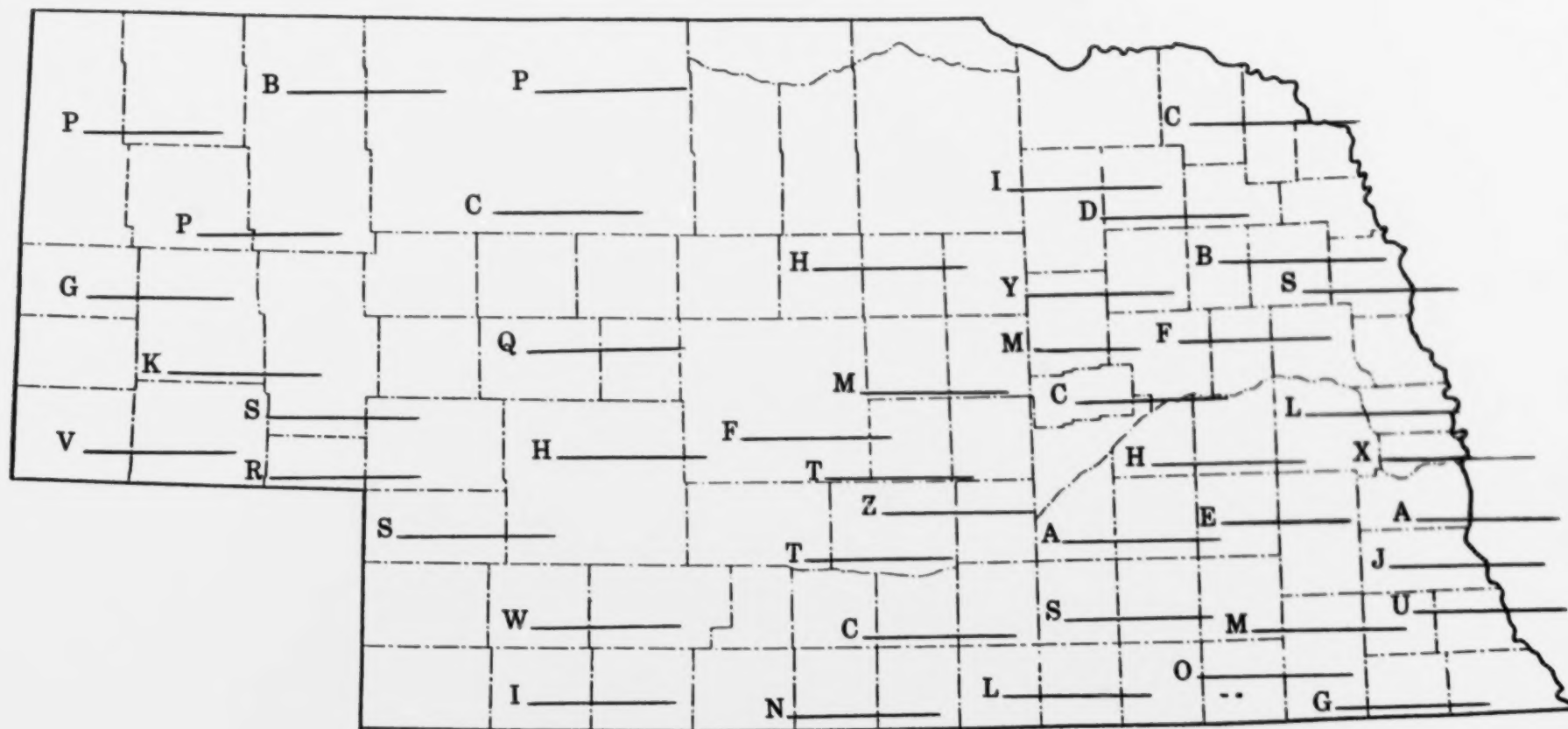


In four to seven days, eat your sprouts. You will find as you eat some, that the next day they will have grown back. Do not forget to keep rinsing them. Use them all by the seventh day, if not, refrigerate them.

Nebraska Agriculture:

Worksheet

From Alfalfa to Zucchini



Alfalfa To Zucchini

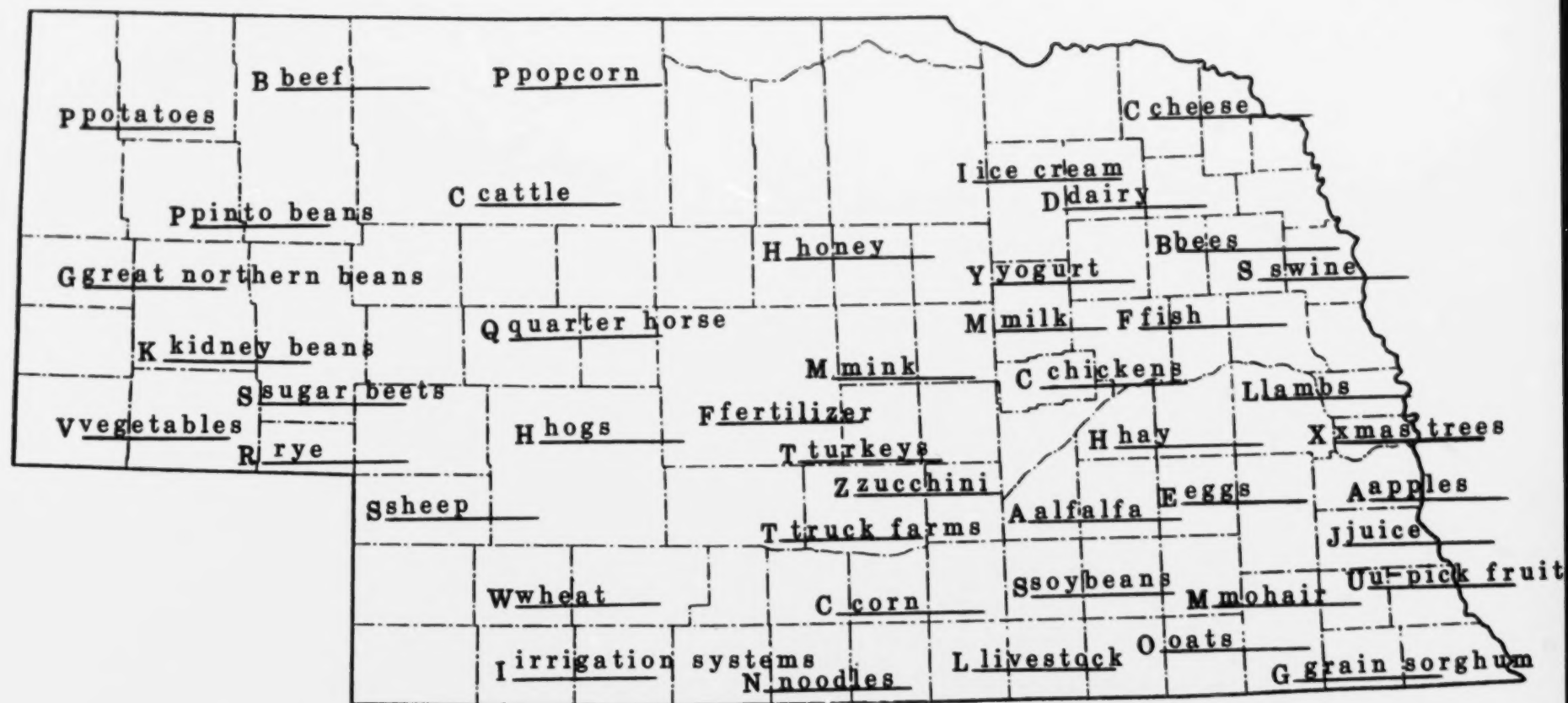
Answer Key A

a -	alfalfa, apples	v -	vegetables
b -	beef, bees	w -	wheat
c -	corn, cattle, chickens, cheese	x -	xmas trees
d -	dairy	y -	yogurt
e -	eggs	z -	zucchini
f -	fertilizer, fish		
g -	great northern beans, grain sorghum		
h -	hay, honey, hogs		
i -	ice cream, irrigation systems		
j -	juice		
k -	kidney beans		
l -	lambs, livestock		
m -	milk, mohair, mink		
n -	noodles		
o -	oats		
p -	pinto beans, popcorn, potatoes		
q -	quarter horses		
r -	rye		
s -	soybeans, sugar beets, swine, sheep		
t -	turkeys, truck farms		
u -	u-pick fruit		

Nebraska Agriculture:

Answer Key B

From Alfalfa to Zucchini



Subject Area: Social Studies/Science

Objective: The student will:

1. be able to gain an awareness of the history of popcorn and its American origin.
2. be able to gain a knowledge of a crop grown in Nebraska.
3. be able to develop map skills.
4. be able to learn parts of a plant and why each part is important to the total life of the plant.

Suggested

Grade Level: 3 - 6

Background: All about popcorn:

How old is popcorn?

When Columbus came to America, he discovered natives were selling necklaces made from popcorn. Popcorn was probably served at the first Thanksgiving feast. Early American housewives served popcorn with sugar and cream for breakfast.

What makes popcorn pop?

Indians thought that a little demon lived inside the popcorn kernel. When the kernel was heated he got hopping mad and caused the kernel to explode or pop. Popcorn really pops because there is moisture trapped inside the hard shell. When its heated, the moisture turns to steam and expands, but the steam can not escape. So the pressure keeps building up, until suddenly POP! The pressure bursts open the kernel. Kernels can pop up to 30 times their size. That's POPCORN!!

Where is popcorn grown?

Popcorn is grown in the states of Nebraska, Kansas, Iowa, Missouri, Illinois, Kentucky, Michigan, Indiana, and Ohio.

How is popcorn made ready for market?

The corn ears that have dried on the stalks are harvested by machine. The kernels are dried so they will have just the right amount of moisture to make them pop. The kernels are sorted by size. They are then put into packages.

How much popcorn do Americans eat?

Americans eat more popcorn than anyone else. We eat about 41 quarts for every man, woman, and child. Kids have always loved popcorn, but sales are up because adults have discovered it too! Popcorn has a low calorie count 25-55, per cup without butter.

Parts of the popcorn plant:

Roots-

The roots are the underground parts of a plant and are important because they provide a firm anchor for the plant and take up water and mineral elements from the soil.

Prop roots-

Because of the height of the corn plant, these roots add stability or support to the plant.

Stem/Stalk-

The stem is the above-ground portion or shoot, which gives the plant its internal structure. A stem has nodes and internodes which are not present in roots. A node is the point on the stem where a leaf is attached.

Leaves-

The leaves are the principal food manufacturing organs of the plant. They absorb carbon dioxide out of the air and intercept sunlight. Their cells contain the green chlorophyll which captures the light energy needed to make food. The leaves supply the plant with water and mineral nutrients from the roots and carry away manufactured food to other parts of the plant.

Tassel-

The tassel produces the pollen sacks which contain the pollen. The wind currents carry the pollen to the silks to fertilize the plant.

Silks-

The silk is a soft hair on the ear. Upon fertilization of each strand of silk, a kernel of corn is formed.

Ear-

The ear of corn consists of rows of kernels.

Resources:

The Popcorn Institute
111 East Wacker Drive
Chicago, Illinois 60601
Phone: (312) 644-6610

Depaola, Tomie. The Popcorn Book. Scholastic Book Service, 1978.

Materials:

1. Worksheet A
2. Activity Sheet A
3. Examples of different kinds of popcorn (white, yellow, and colored).

Procedure:

1. Using the background information, a bubble or popcorn shape with the question and answer about popcorn would be an attractive bulletin board or learning center display.
2. Worksheet A could be used as a group project or with the learning center.
3. The states growing popcorn could be located on a map. As a small group project, a poster showing the location of the popcorn growing states.
4. Activity Sheet A - The parts of a popcorn plant.
 - A. Use for a class discussion.
 - B. Use as a student worksheet.
 - C. Use as a transparency with overlays.

Additional
Activities:

Popcorn Cake

8 quarts popped popcorn

1 24 ounce package
miniature marshmallows

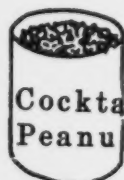
1 stick margarine



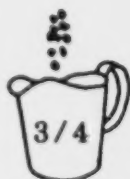
melted



1 pound can salted peanuts



3/4 cup raisins



Pop the popcorn. Dissolve marshmallows in the melted butter.
Combine popcorn, peanuts and raisins. Add marshmallow mixture.
Mix well. Press into a greased cake pan. Cool until firm.



All About Popcorn

Worksheet A

Name: _____

Read the popcorn facts carefully. Answer each question.
Check the answers with answer key.



1. What did Columbus discover when he came to America?

2. How many states grow popcorn? _____
Name three of them.



a. _____

b. _____

c. _____

3. Indians thought that a _____ was found in
the center of popcorn that causes it to pop.

4. What was served at the first Thanksgiving feast?

5. What is found in the center of popcorn that causes it to pop?

6. How many calories are in popcorn? _____

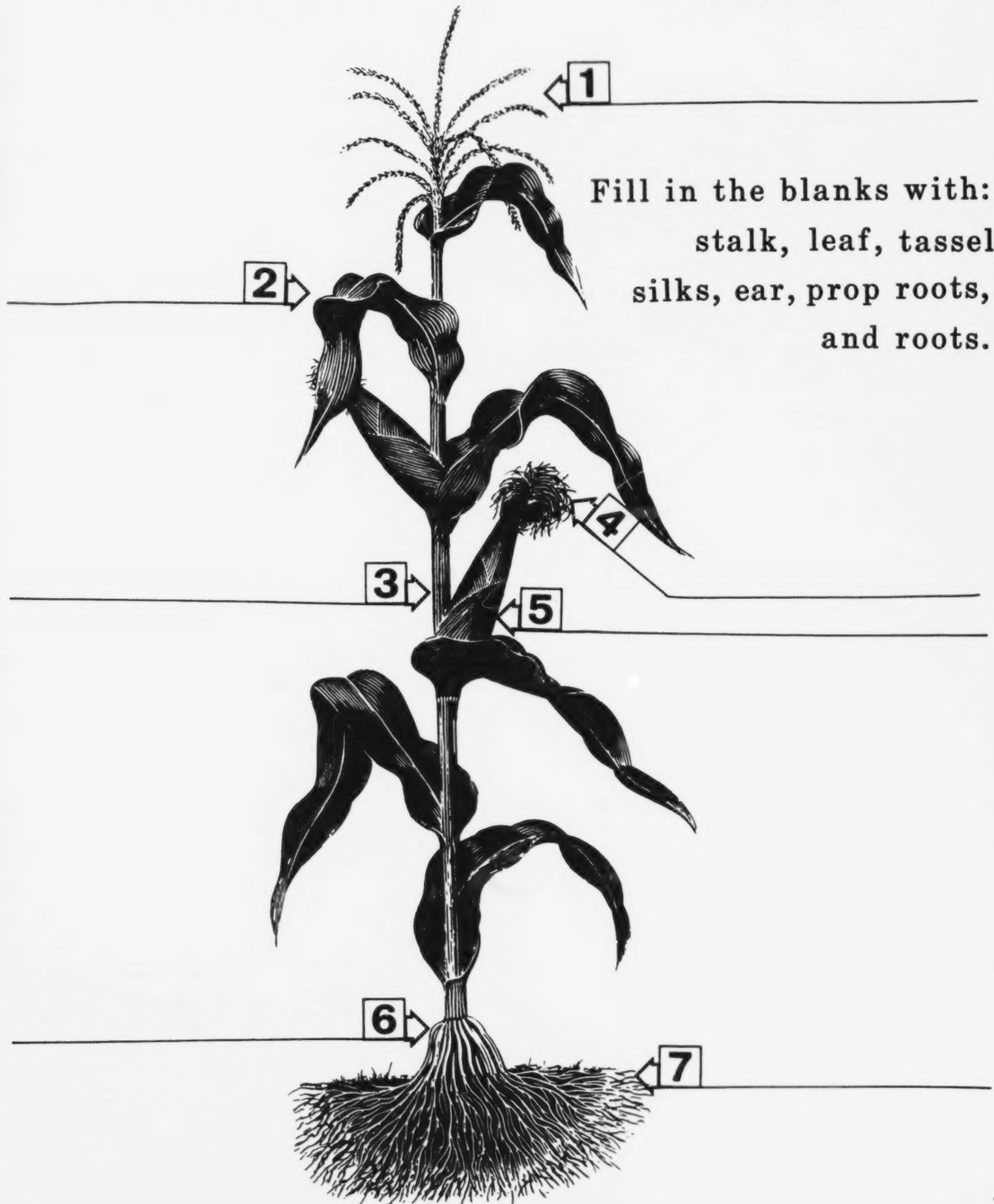
7. What is the last step to make popcorn ready for market?

8. Popcorn can pop up to _____ times it's size.



All About Popcorn

Activity Sheet A



All About Popcorn

Answer Key

Worksheet A

Name: _____

Read the popcorn facts carefully. Answer each question.
Check the answers with answer key.



1. What did Columbus discover when he came to America?

(natives selling necklaces made from popcorn)

2. How many states grow popcorn? (nine)

Name three of them.

a. (can be any of the following: Iowa,)

b. (Nebraska, Kansas, Missouri, Illinois,)

c. (Kentucky, Michigan, Indiana, and Ohio.)

3. Indians thought that a (little demon) _____ was found in the center of popcorn that causes it to pop.

4. What was served at the first Thanksgiving feast?
(popcorn)

5. What is found in the center of popcorn that causes it to pop?
(moisture or steam)

6. How many calories are in popcorn? (25-55 calories per cup)

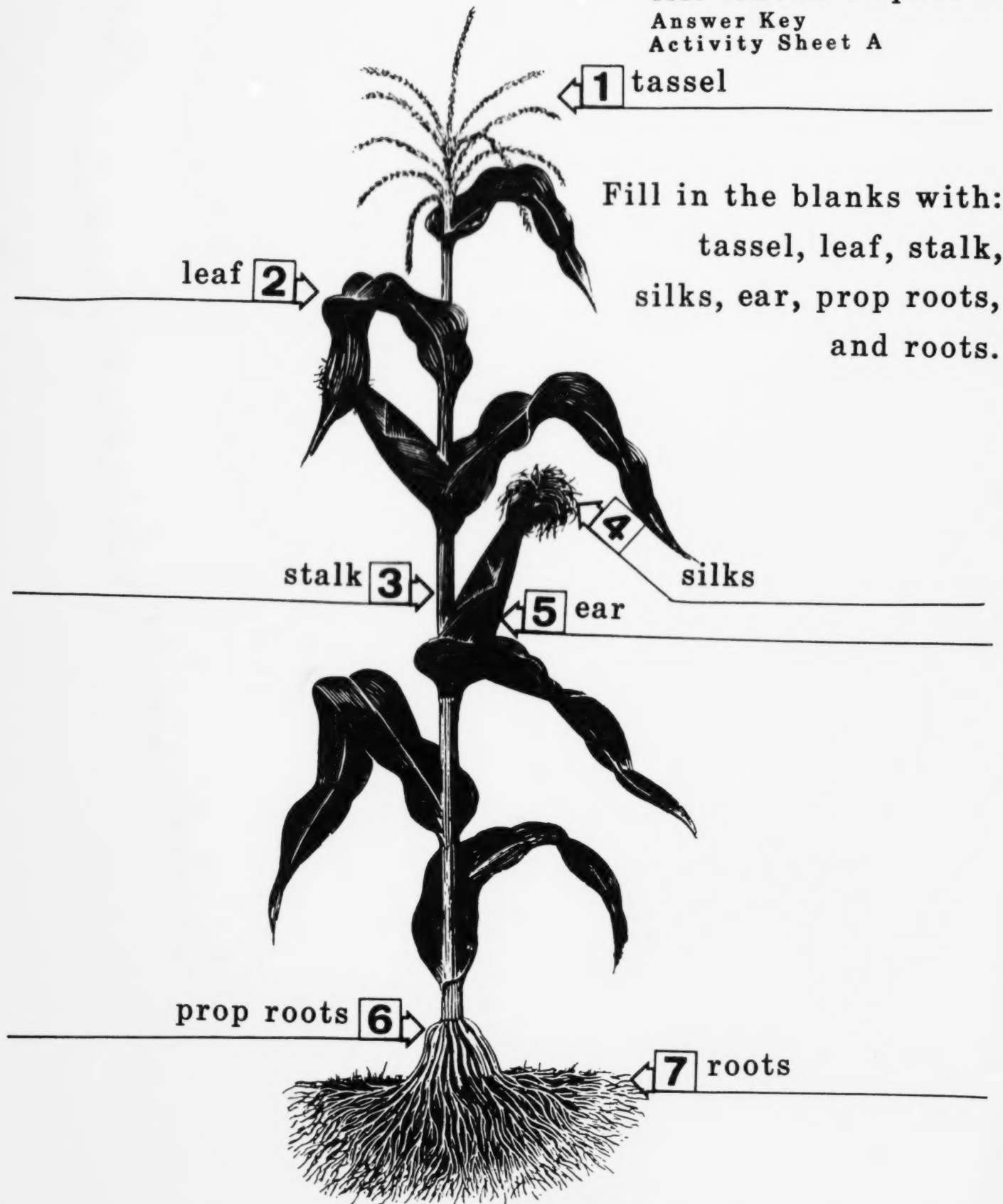
7. What is the last step to make popcorn ready for market?
(kernels are put into packages)

8. Popcorn can pop up to (30) _____ times it's size.



All About Popcorn

Answer Key
Activity Sheet A



Subject Area: Language Arts

Objective: The student will:

1. define and use in context the common terms associated with cattle.

Suggested

Grade Level: 3 - 4

Background:

Terms	Definitions
1. Cow	The mother of a calf, or a female who has had calves.
2. Steer	A young male raised for meat
3. Bull	The father of calves
4. Heifer	A female that has not had calves
5. Calf	A young heifer, steer, or bull
6. Calves	A group of young cattle
7. Cattle	A group of cows, steers, bulls or heifers
8. Herd	A group of cattle
9. Dairy Cow	Cows raised to give milk
10. Beef	Meat from cattle

Resources:

Nebraska Beef Industry Development Board
Rovar Park, Bldg. 1, Unit 1
East Highway 30
Kearney, Nebraska 68847-2408
Phone: (308) 236-7551

Dairy Council of Central States, offices located at:

Suite 103 Hillcrest Building
Ralston, Nebraska 68137
Phone: (402) 592-3355

4740 A Street
Lincoln, Nebraska 68510
Phone: (402) 488-0153

620 Badgerow Building
4th and Jackson Streets
Sioux City, Iowa 51101
Phone: (712) 252-2932

Materials:

1. Worksheets A and B
2. Cattle pictures, posters and books
3. Cattle term game cards
4. Answer Key A and B

Procedure:

1. To introduce this lesson have cattle pictures and books around your room. A farmer, rancher, FFA or 4-H member may be available as a guest speaker. Topics for discussion could be: raising cattle, breeds of cattle, and beef by-products. Through the discussion students may share information about friends or relatives that raise cattle.
2. Display the cow term cards to generate definitions from the students for each term. The definition card can be shown when the correct definition is achieved. Do all ten terms and discuss.
3. Have students complete Worksheet A. You may want to correct it together to insure understanding.
4. Play the Cattle Terms Game by giving ten students a term card and ten other students a definition card. Give them a few minutes to find their match. To find their match, a student with a definition card will pick someone with a term card and show their card. The student with the definition card must decide if they have formed a match. If so, they sit down. Read their matches to the class as a check to review.
5. Have students complete Worksheet B. These can be used as a review for retention and understanding.

What am I?

Using these terms, fill in the blank with the correct answer.

REMEMBER -- spelling is important!

beef calves herd heifer dairy cow
calf bull cattle cow steer

1. I am very small and young. _____
2. I am a mother. _____
3. This is the meat from cattle. _____
4. I am a male raised for meat. _____
5. I am able to produce lots of milk! _____
6. I am a father. _____
7. We are a group of cattle. _____
8. I am a female that has not had any calves. _____
9. We are young cattle. _____
10. Cows, steers, heifers, and bulls is what we are. _____

----- Fold your paper on this line -----

Now see if you can write a definition for each of these terms.

1. heifer _____
2. bull _____
3. calf _____
4. steer _____
5. beef _____
6. cow _____
7. dairy cows _____
8. cattle _____
9. herd _____
10. calves _____

Match the term on the left with the definition on the right by putting the correct letter after the term.



Remember -- the cattle are counting on you!

- | | |
|------------------|--|
| cow _____ | A. A female that has not had any calves. |
| steer _____ | B. A group of cattle. |
| calf _____ | C. A young male raised for meat. |
| cattle _____ | D. The mother of calves. |
| bull _____ | E. The father animal. |
| dairy cows _____ | F. A group of young cattle. |
| heifer _____ | G. A young heifer, steer, or bull. |
| herd _____ | H. Cows, bulls, steer, or bull. |
| calves _____ | I. Cows that are raised to give milk. |
| beef _____ | J. The meat from cattle. |



Unscramble These

- | | |
|--------------|--------------|
| lblu _____ | dehr _____ |
| febe _____ | wcos _____ |
| retes _____ | ehrfie _____ |
| lsceav _____ | tectal _____ |
| yardia _____ | lcaf _____ |

What am I?

Using these terms, fill in the blank with the correct answer.

REMEMBER -- Spelling is important!

	beef	calves	herd	heifer	dairy cow
calf		bull	cattle	cow	steer

- | | |
|--|-----------|
| 1. I am very small and young. | calf |
| 2. I am a mother. | cow |
| 3. This is the meat from cattle. | beef |
| 4. I am a male raised for meat. | steer |
| 5. I am able to produce lots of milk. | dairy cow |
| 6. I am a father. | bull |
| 7. We are a group of cattle. | herd |
| 8. I am a female that has not had any calves. | heifer |
| 9. We are young cattle. | calves |
| 10. Cows, steers, heifers, and bulls is what we are. | cattle |

----- Fold your paper on this line -----

Now see if you can write a definition for each of these terms.

- | | |
|--------------|--|
| 1. heifer | A female that has not had calves. |
| 2. bull | The father of calves. |
| 3. calf | A young heifer , bull, or steer. |
| 4. steer | A young male raised for meat. |
| 5. beef | Meat from cattle. |
| 6. cow | The mother of calves. |
| 7. dairy cow | Cows raised to give milk. |
| 8. cattle | A group of cows, steers, bulls, and heifers. |
| 9. herd | A group of cattle. |
| 10. calves | A group of young cattle. |

Cattle Chatter

Answer Key B

Match the term on the left with the definition on the right by putting the correct letter after the term.



Remember -- the cattle are counting on you!

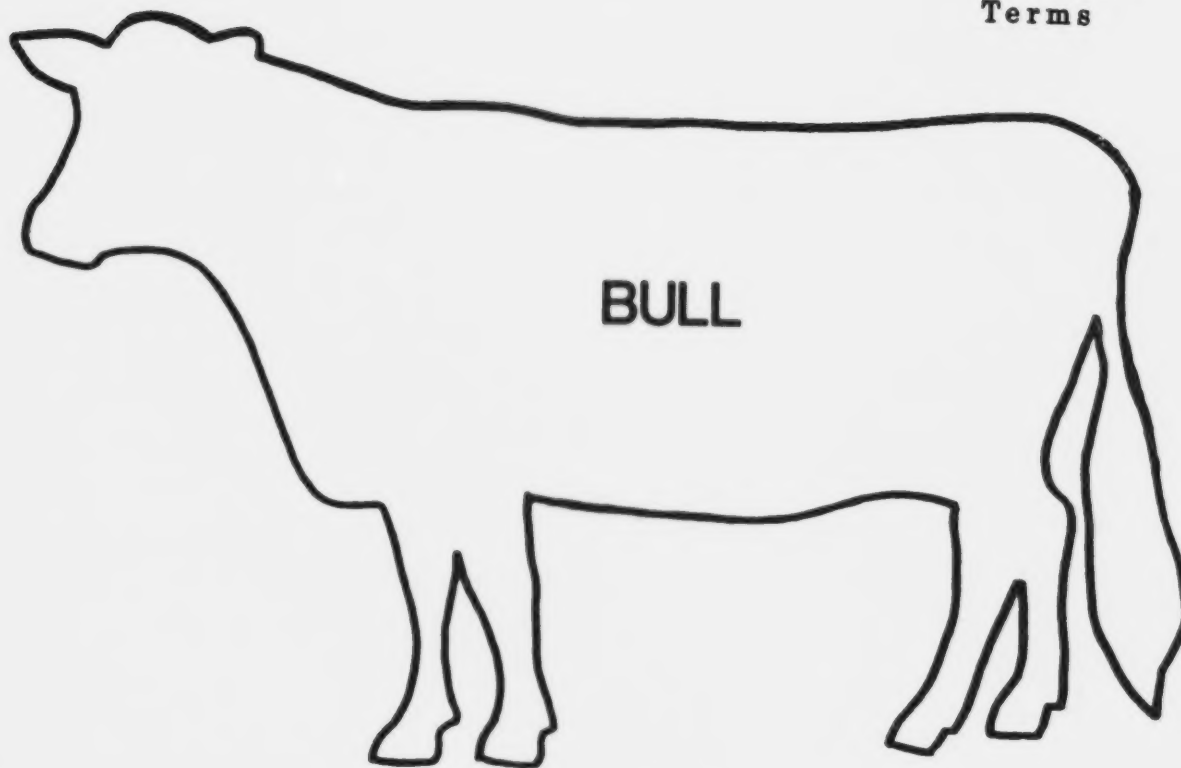
cow	<u>D</u>	A. A female that has not had any calves.
steer	<u>C</u>	B. A group of cattle.
calf	<u>G</u>	C. A young male raised for meat.
cattle	<u>H</u>	D. The mother of calves.
bull	<u>E</u>	E. The father animal.
dairy cows	<u>I</u>	F. A group of young cattle
heifer	<u>A</u>	G. A young heifer, steer, or bull.
herd	<u>B</u>	H. Cows, bulls, steers or/and heifers.
calves	<u>F</u>	I. Cows that are raised to give milk.
beef	<u>J</u>	J. The meat from cattle.



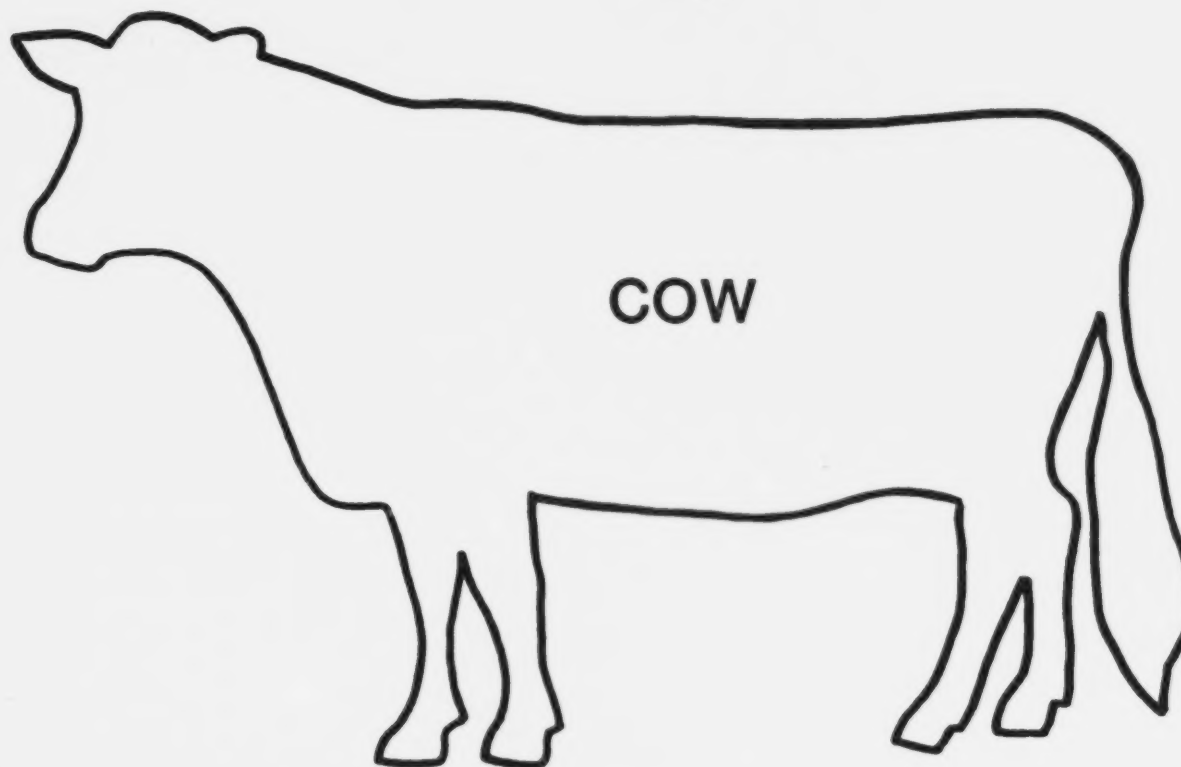
Unscramble These

lblu	<u>bull</u>	dehr	<u>herd</u>
febe	<u>beef</u>	wcos	<u>cows</u>
retes	<u>steer</u>	ehrfie	<u>heifer</u>
lsceav	<u>calves</u>	tectal	<u>cattle</u>
yardia	<u>dairy</u>	lcaf	<u>calf</u>

Cattle Chatter
Game Cards
Terms

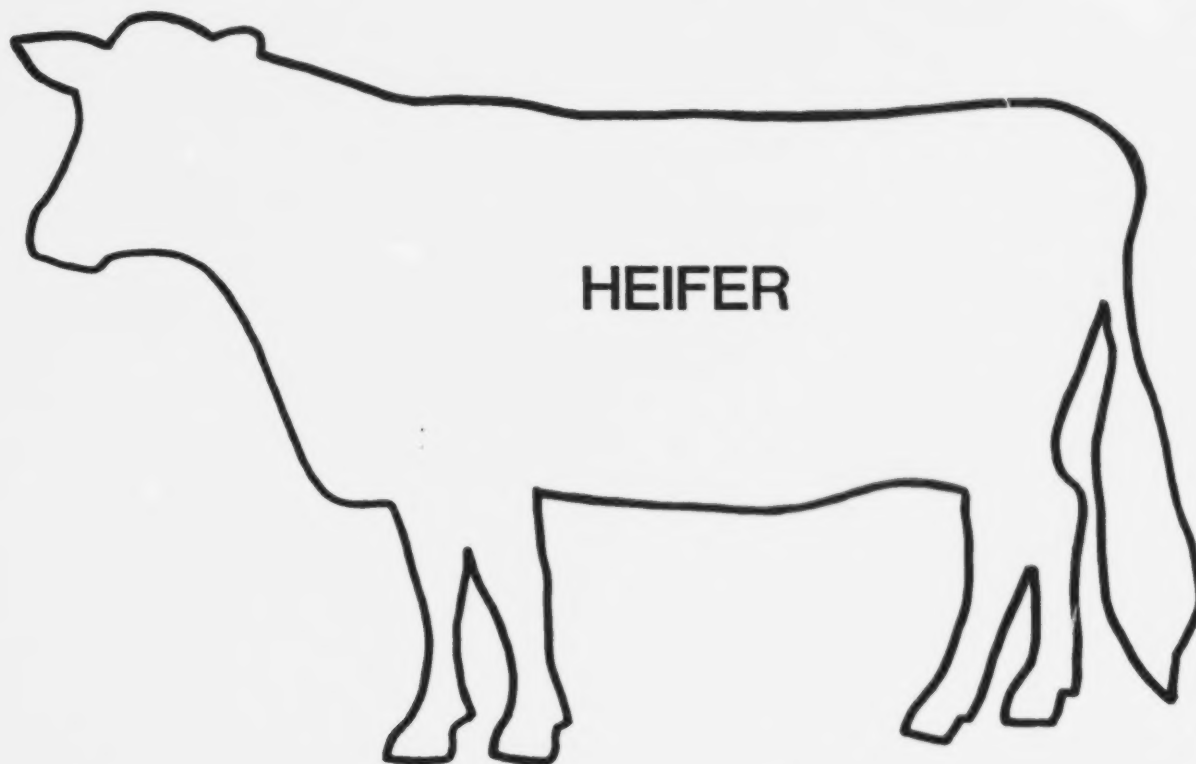
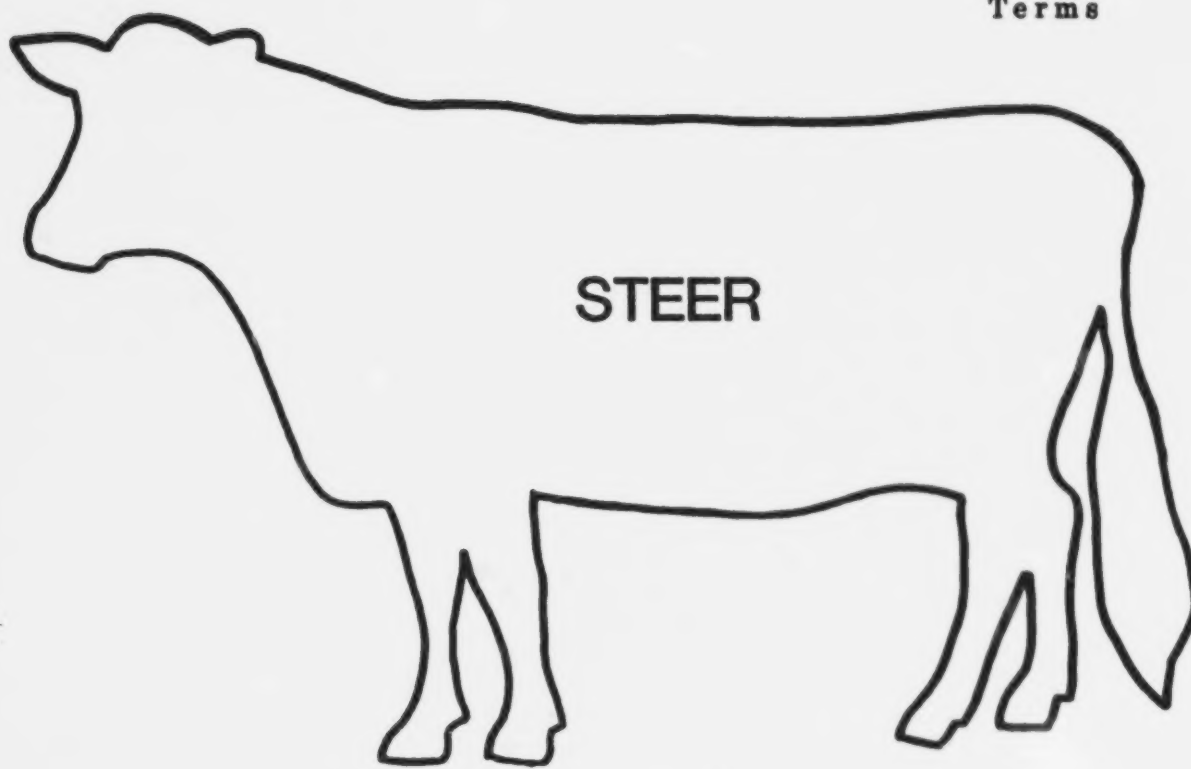


BULL

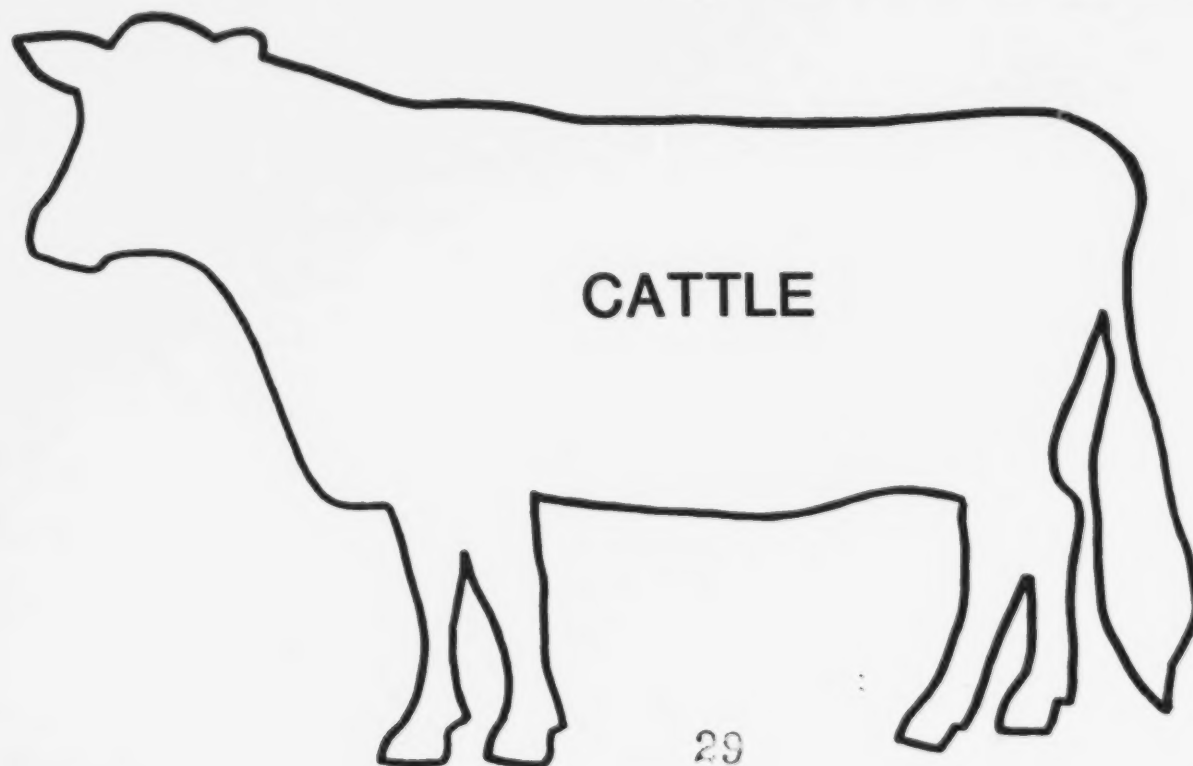
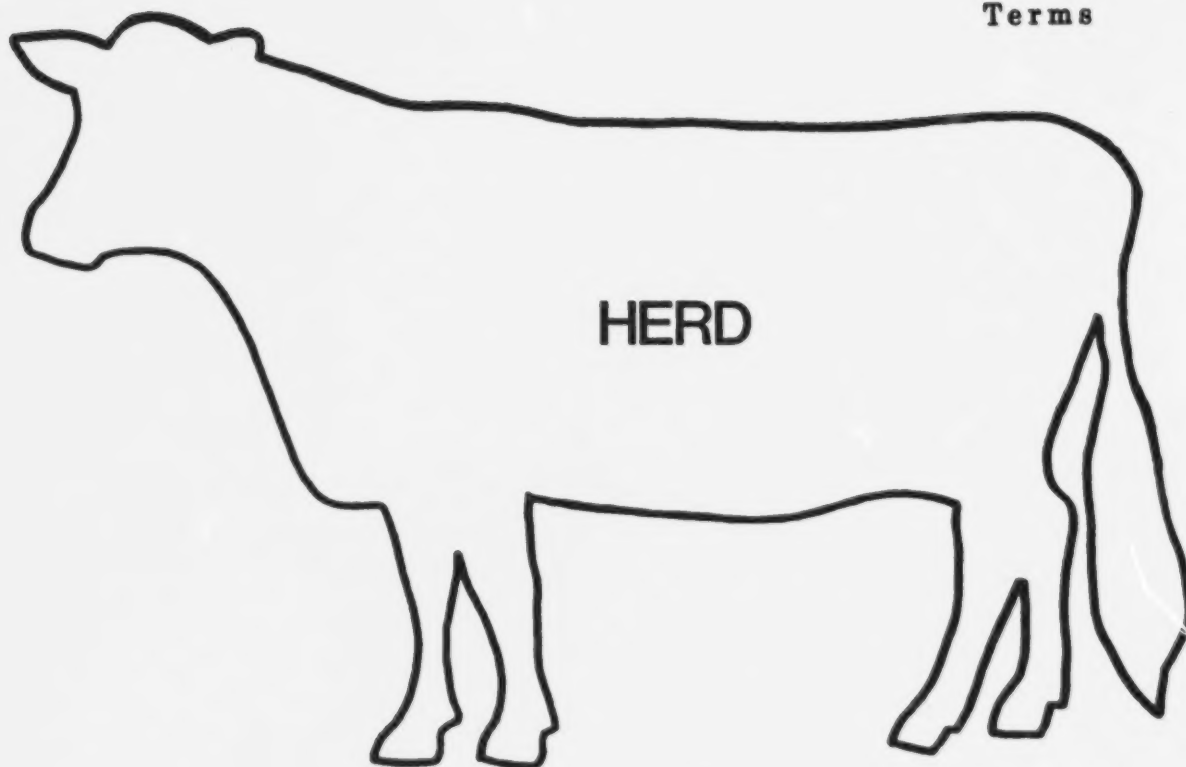


COW

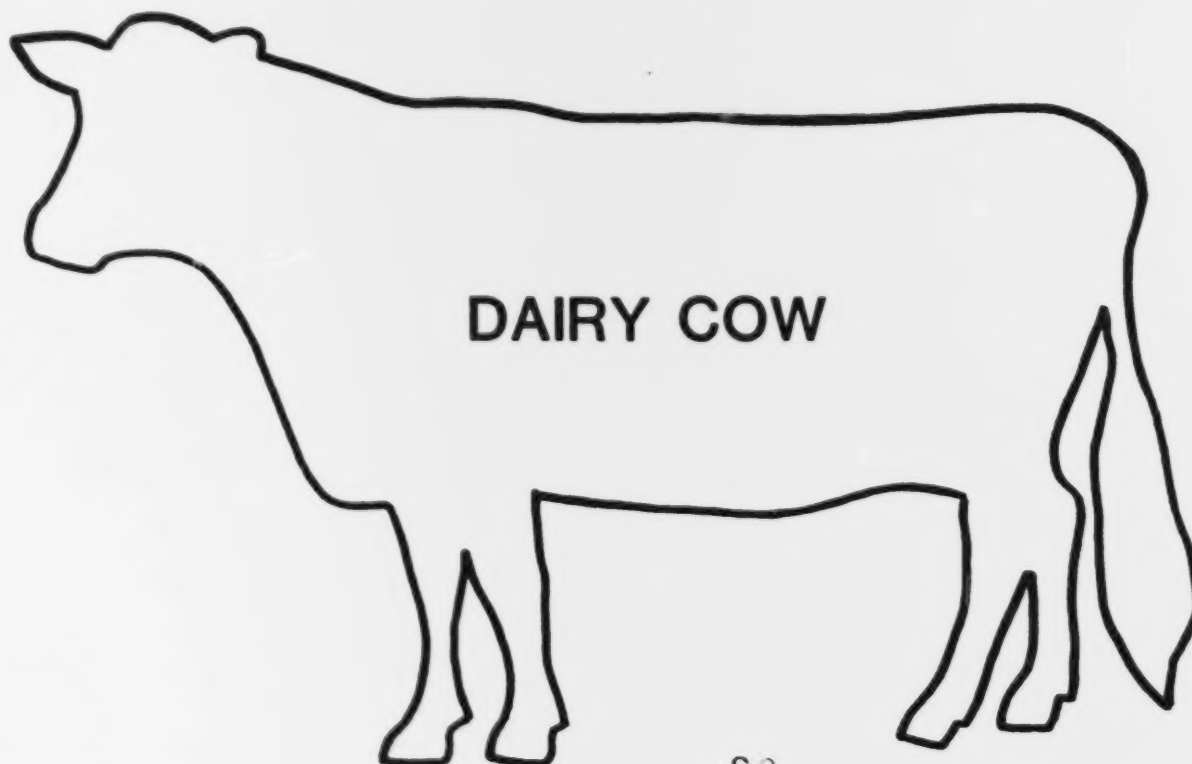
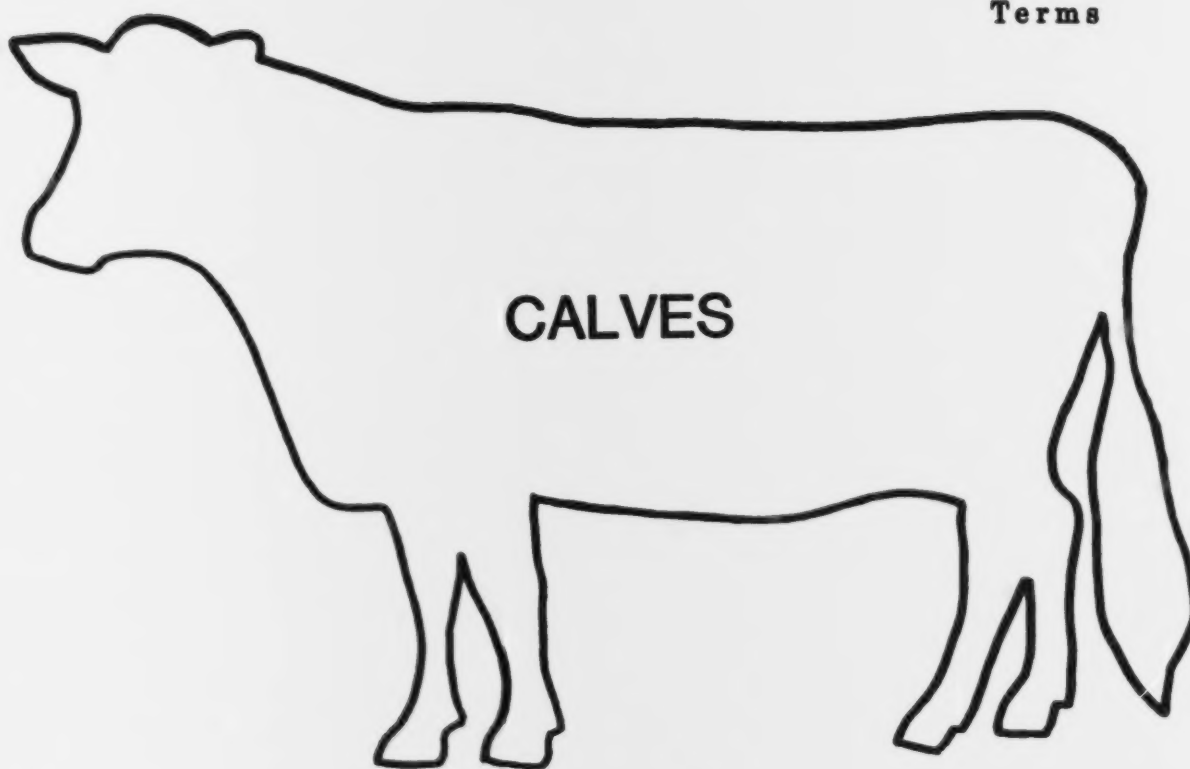
Cattle Chatter
Game Cards
Terms



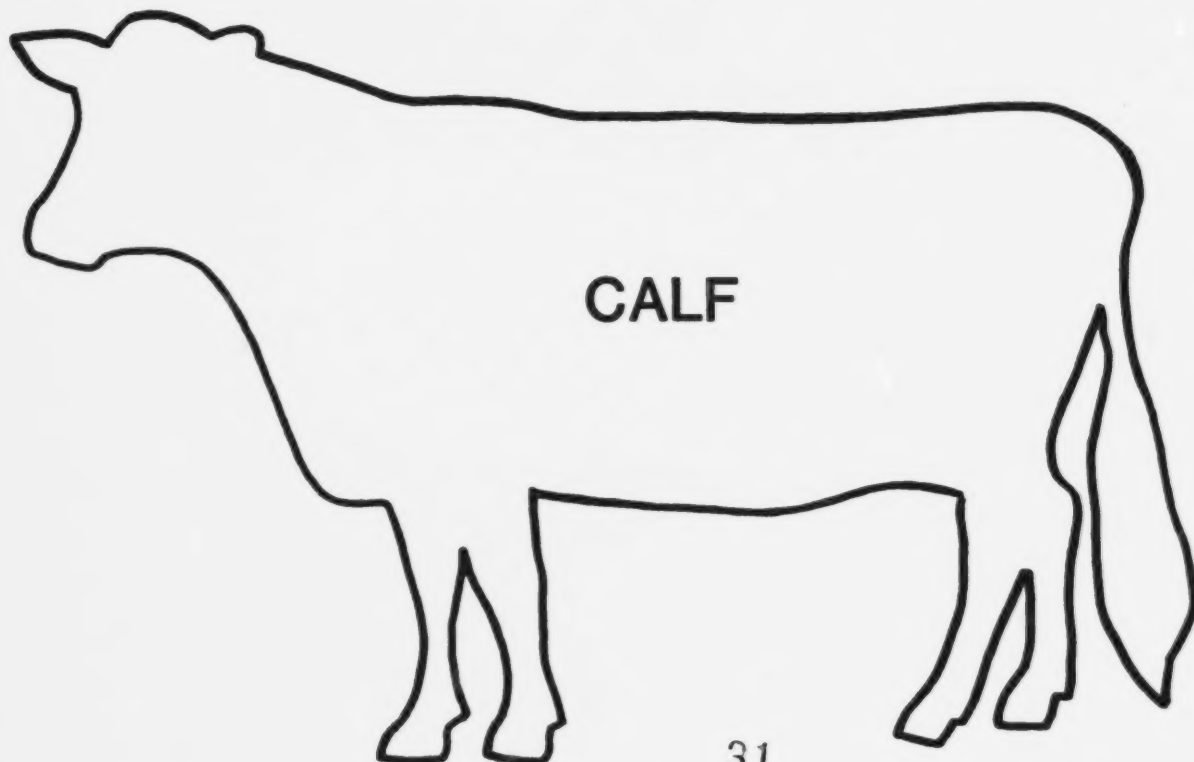
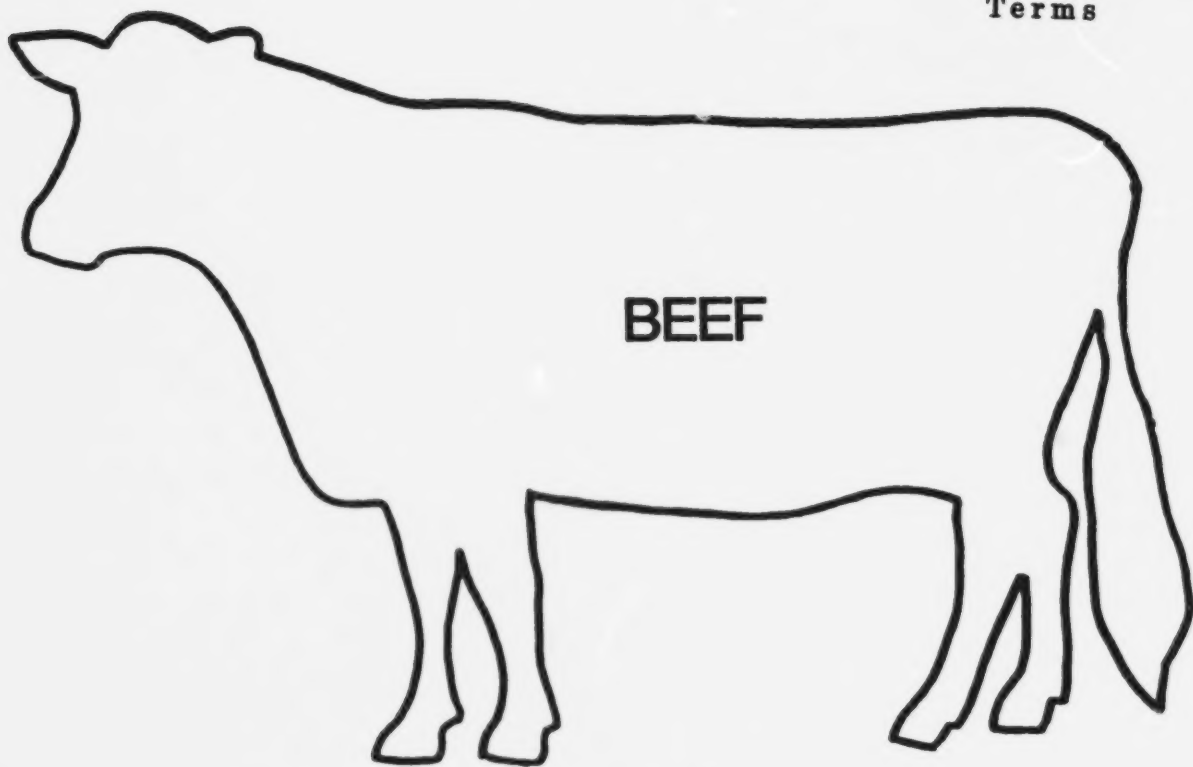
Cattle Chatter
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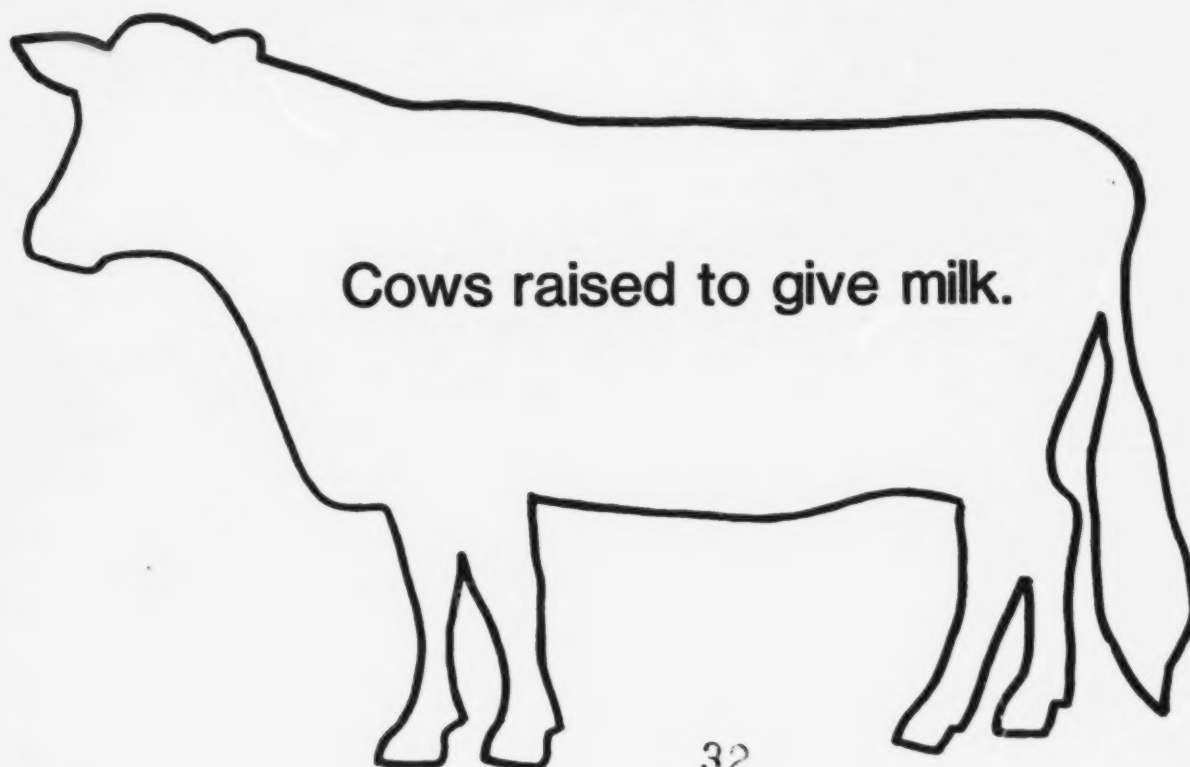
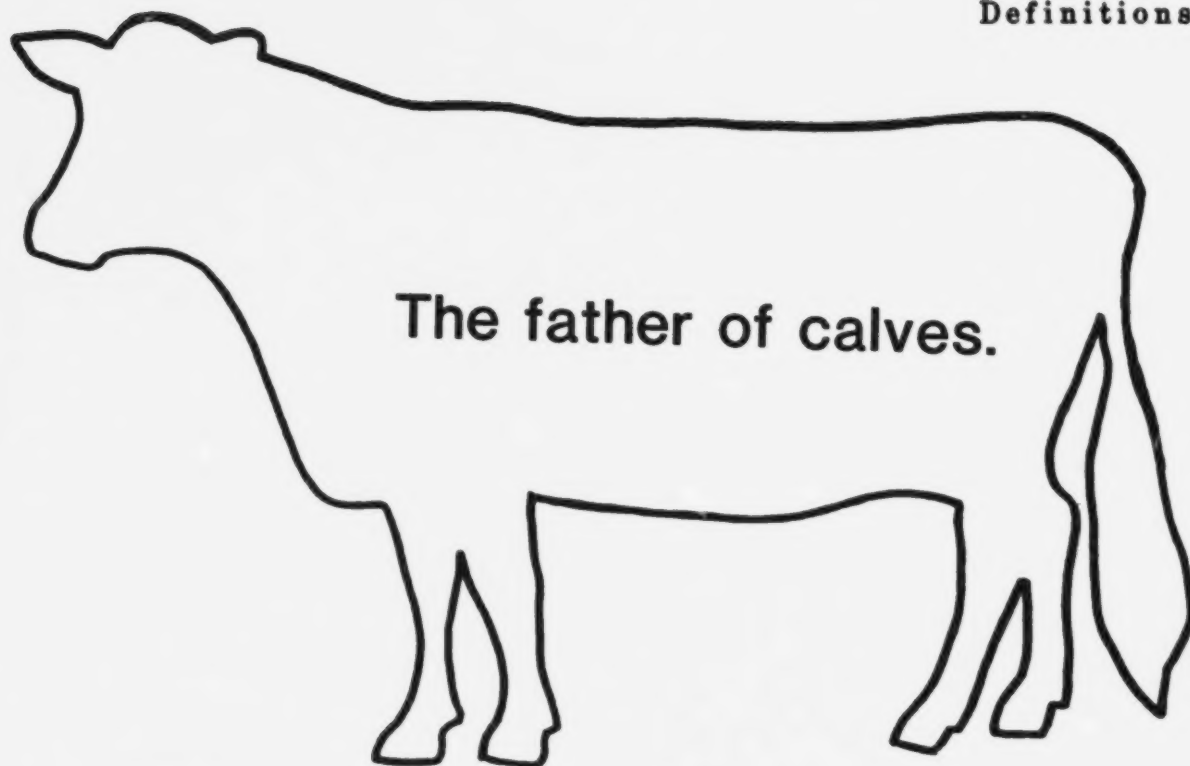
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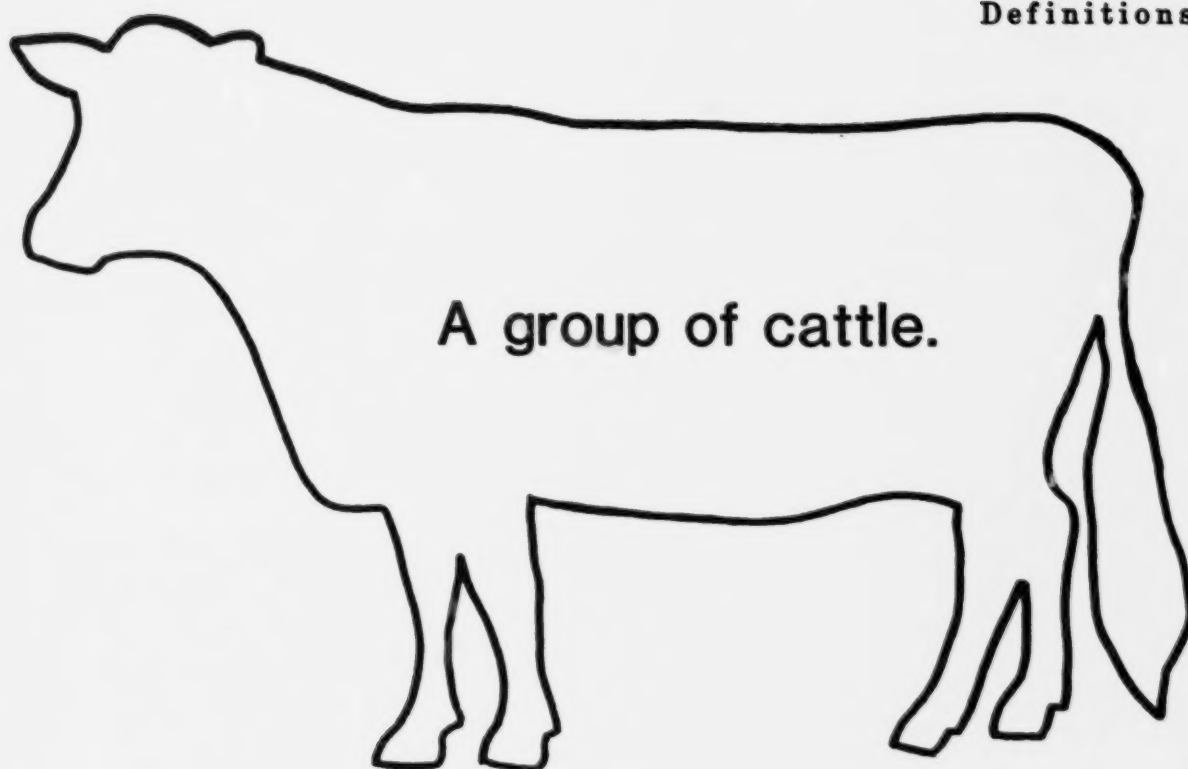
Cattle Chatter
Game Cards
Terms



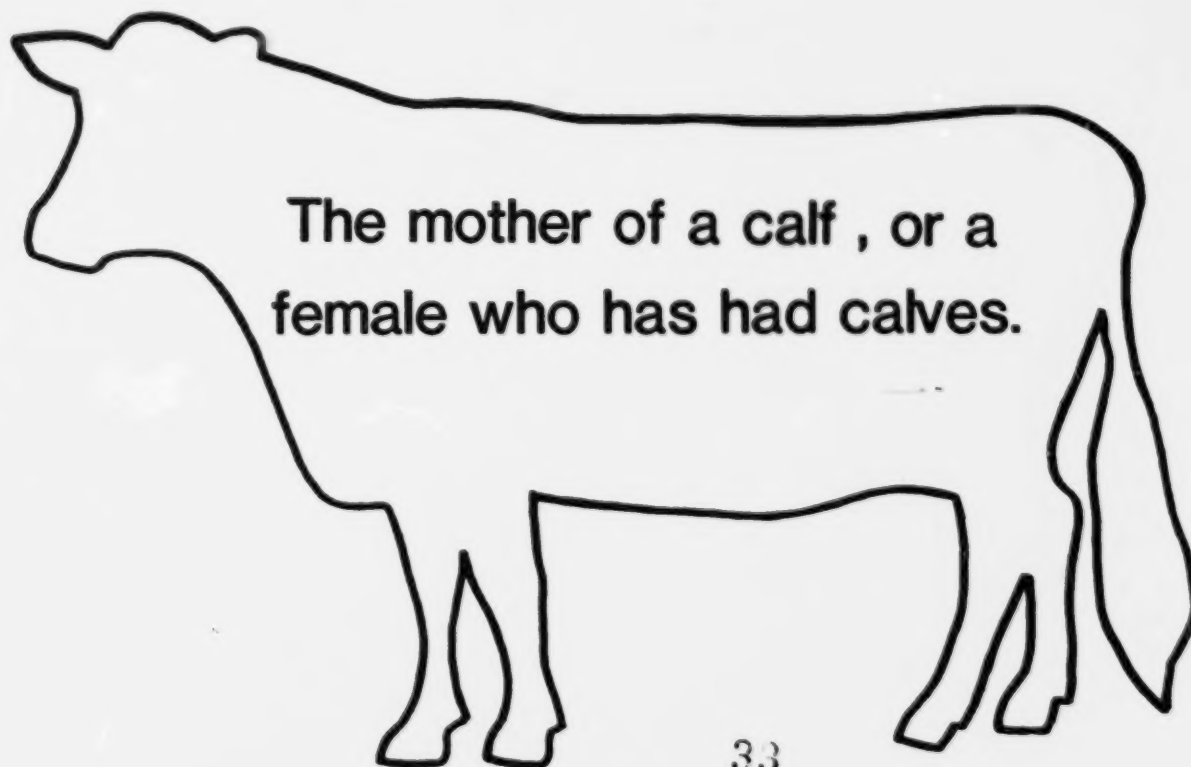
Cattle Chatter
Game Cards
Definitions



Cattle Chatter
Game Cards
Definitions

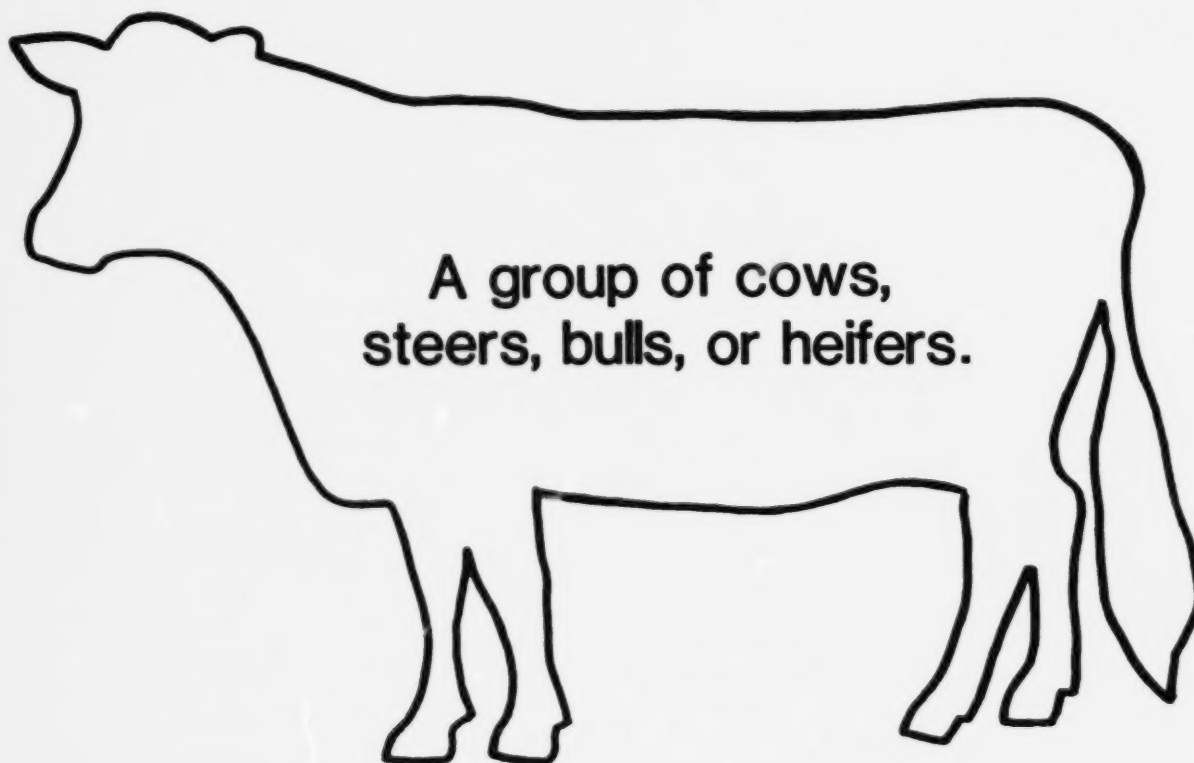
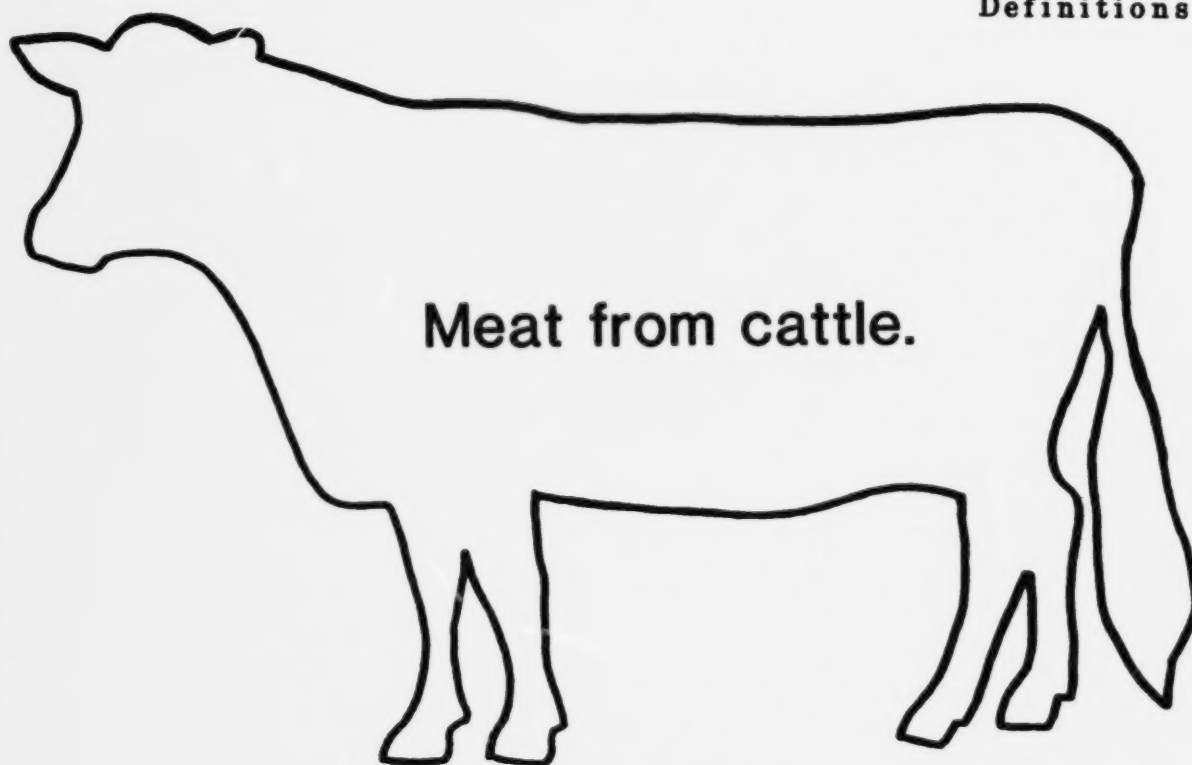


A group of cattle.

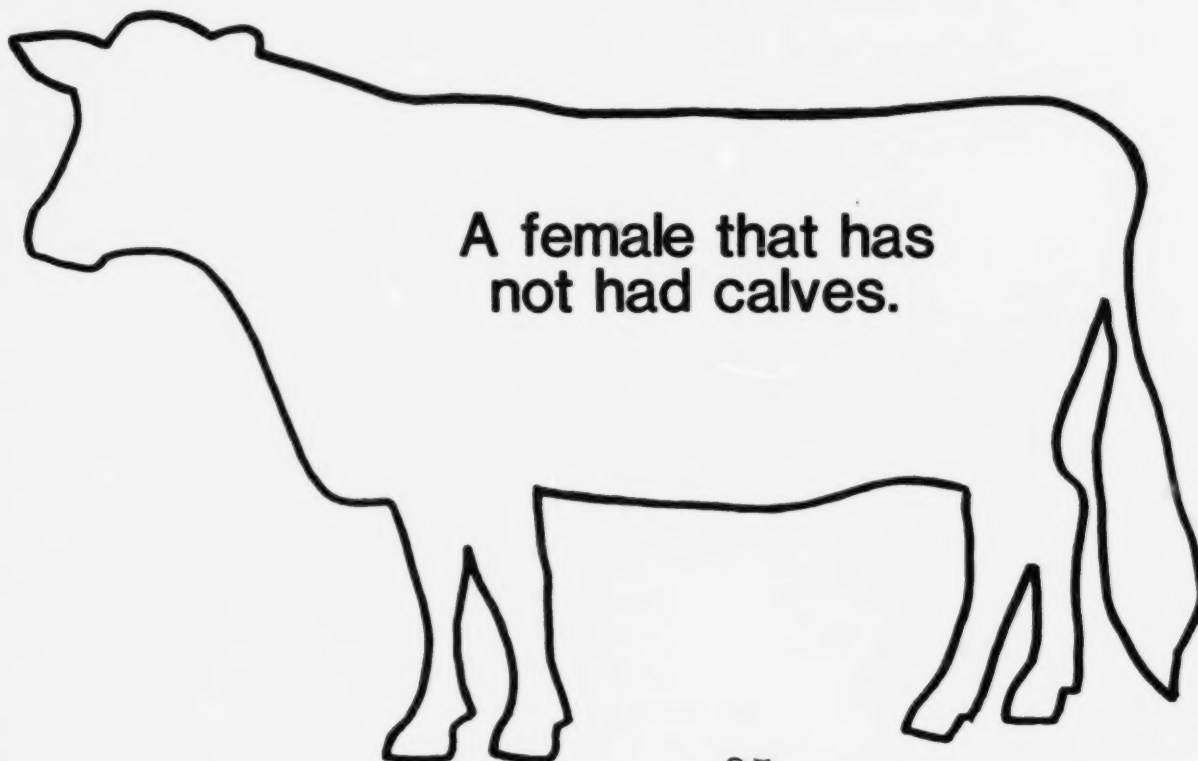
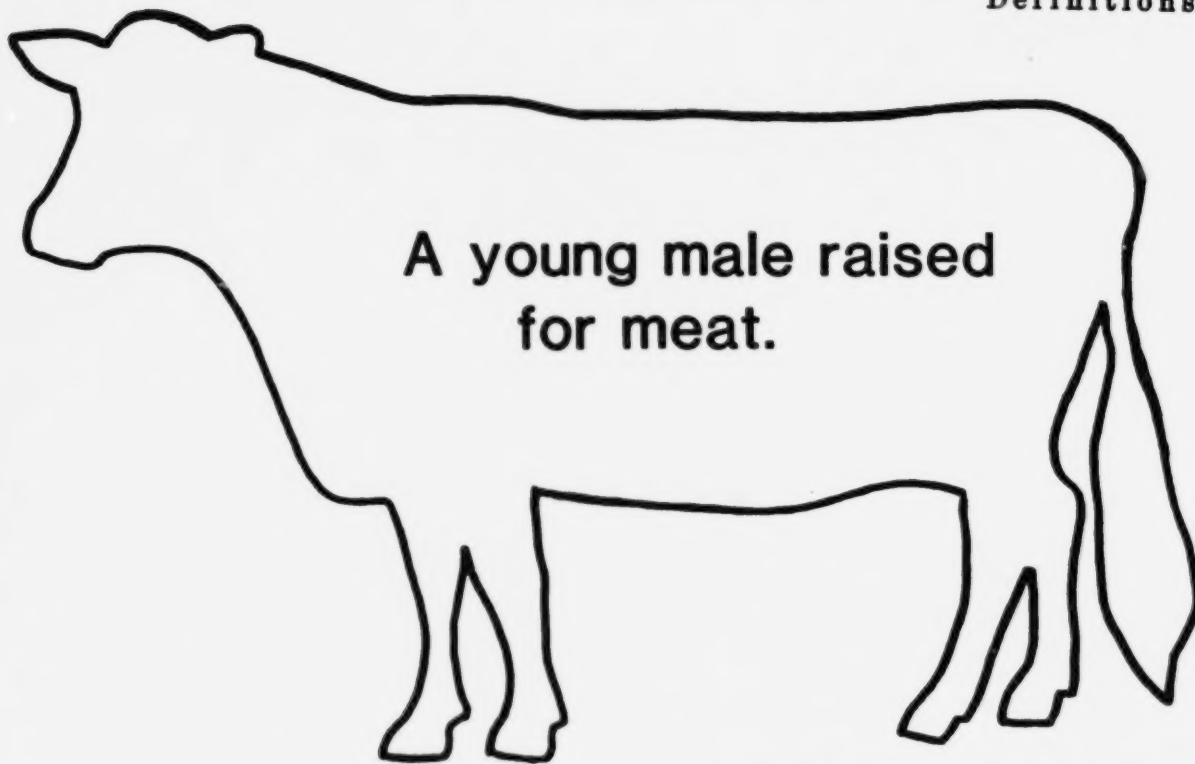


The mother of a calf , or a
female who has had calves.

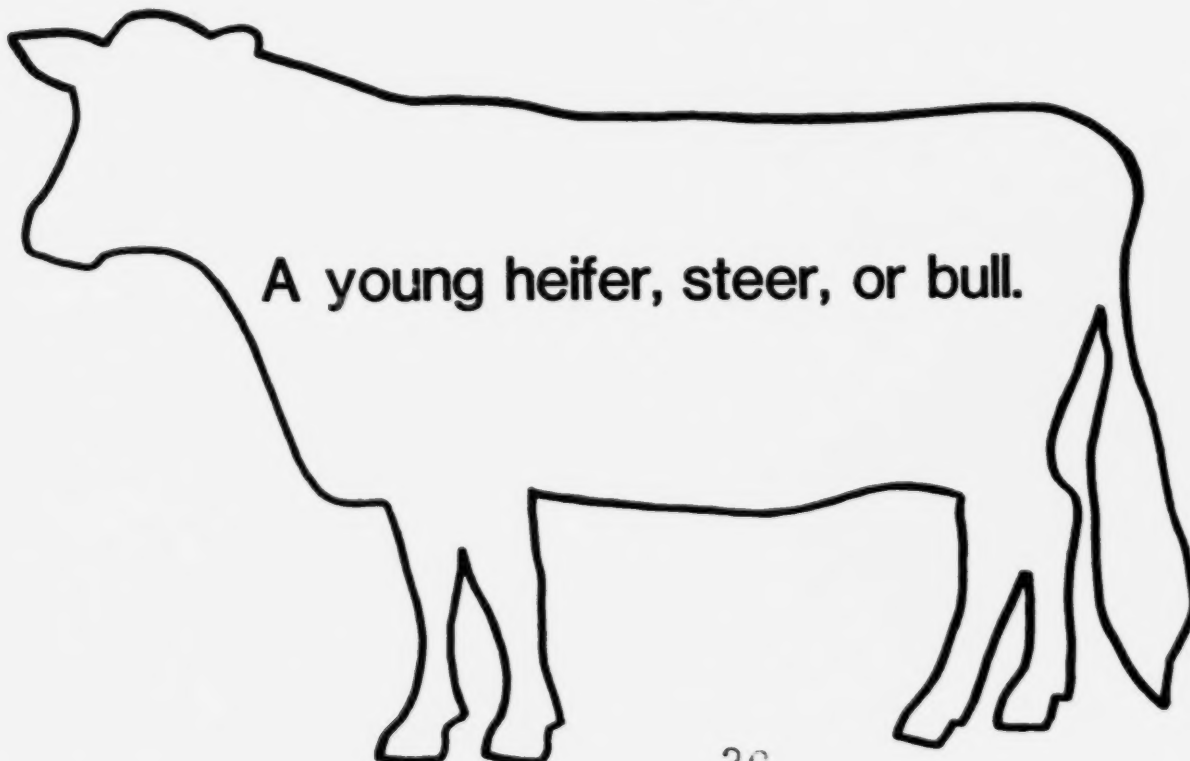
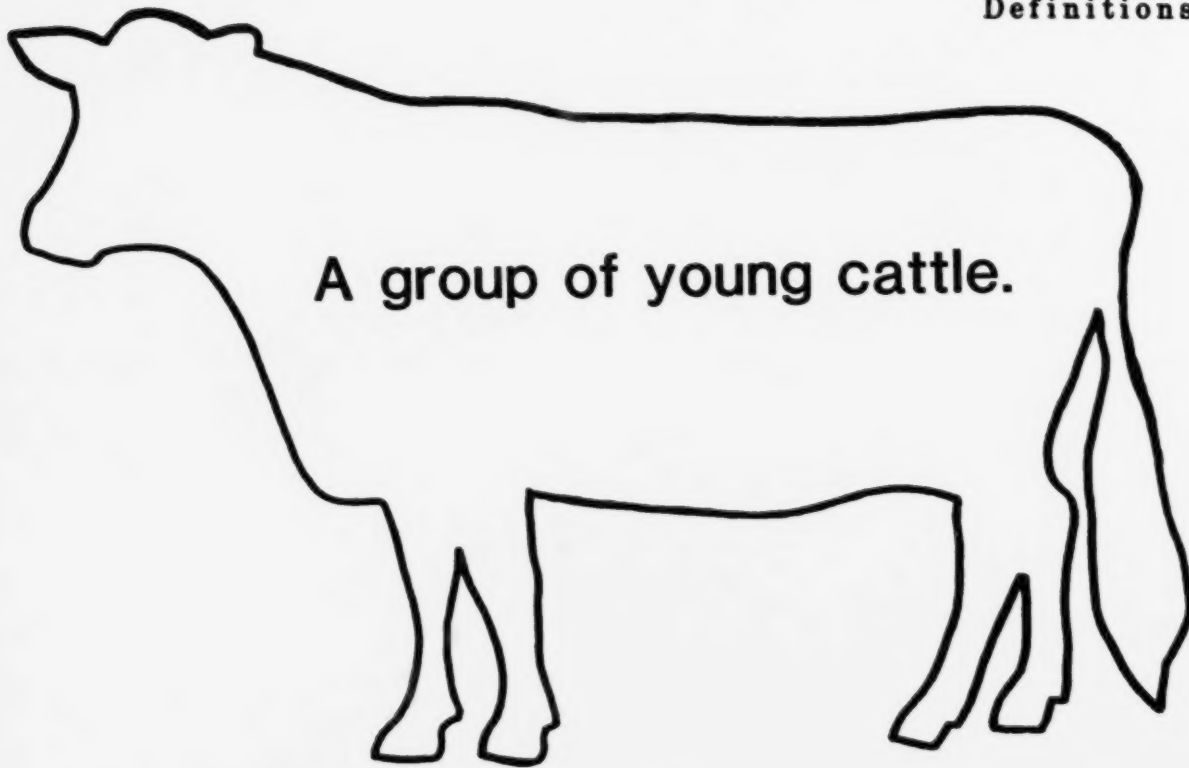
Cattle Chatter
Game Cards
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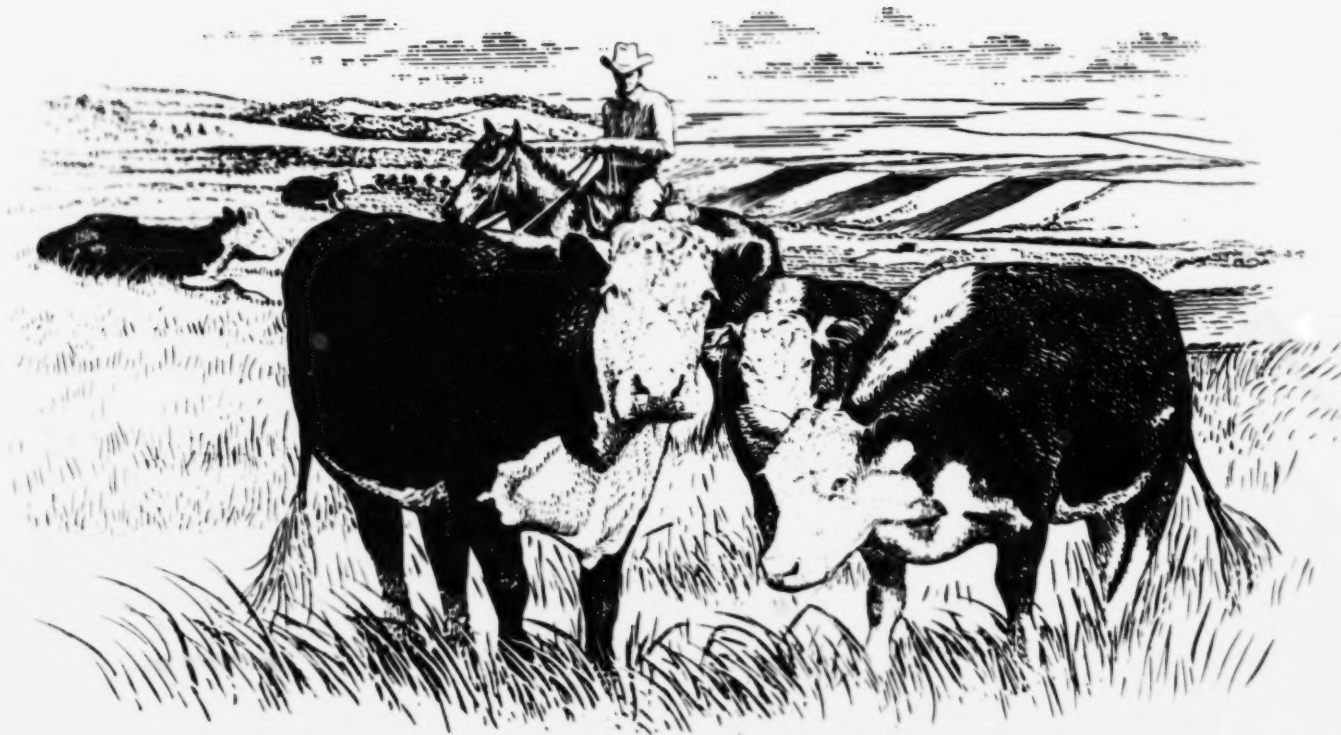
Cattle Chatter
Game Cards
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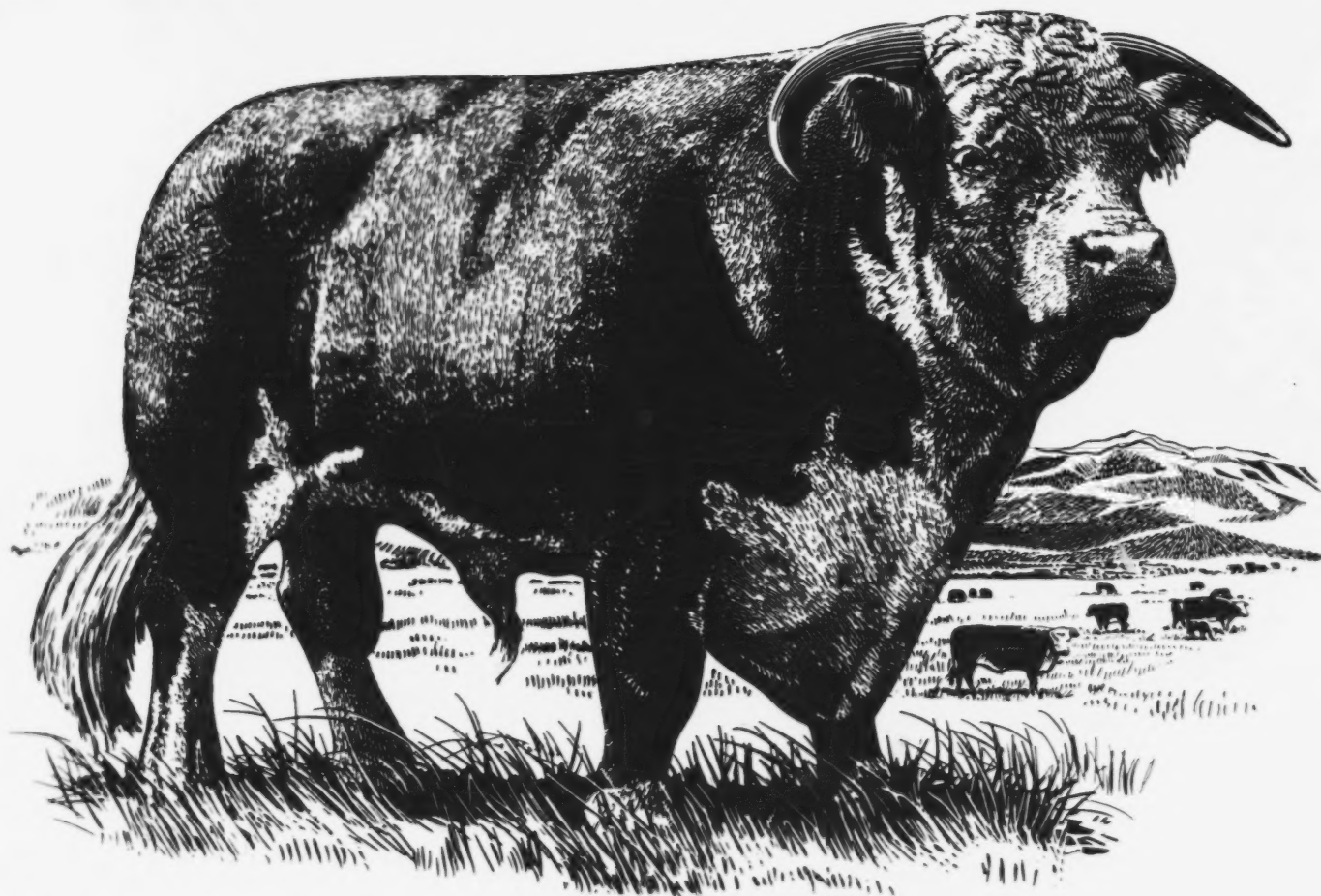


Cattle Chatter
Game Cards
Definitions











Cattle Chatter





Subject Area: Language Arts

Objective: The student will:

1. define the common terms associated with the product corn.
2. be able to reinforce alphabetical order.

Suggested

Grade Level: 3 - 6

Background: See Worksheet A for terms and their definitions.

Resources: Nebraska Corn Board
P.O. Box 95107
Lincoln, Nebraska 68509

Phone: (402) 471-2787

Materials:

1. Activity Sheet A
2. Activity Sheet B
3. Answer Key

Procedure:

1. Discuss and show the ear of corn and the definitions. The students will place the definition over the term. When finished the students will check their work with the answer key. The terms are listed in alphabetical order.
2. The corn activity will be placed in the learning center. Two students may work together matching terms and definitions.

Corny Words Activity Sheet B

storage for silage	stem of a corn plant	seed of an ear of corn
agricultural product	another word for corn	a grain that grows in ears
the center of an ear of corn	moisture for corn	corn harvesting season
color and type of corn planted in Nebraska	a building for sheltering livestock and crops	man or woman who manages a farm
fuel made from processed corn	the top of the corn plant that produces pollen	the part of the plant that grows underground
corn planting season	pest that chews on the corn plant	a weather condition that can damage corn
machine pulled behind a tractor that plants corn	covering on an ear of corn	machine used for turning over the soil
most important layer of soil	to prepare the land for crops	material put on or in soil to improve plant growth
machine for harvesting grain	a way to measure grain	storage place for corn
to sprout and begin to grow	warehouse for storing grain	area of land about the size of a football field
part of the plant where kernels grow	cutting and gathering grain from the field	full grown animal that eats corn
corn plants in a line	a type of corn that will pop when heated	large animal that eats corn
a new corn plant made by crossing two others	harvesting the whole corn plant	to send products to other countries
made from corn and you eat it for breakfast	liquid sugar made from corn	place where corn is grown
a young plant grown from seed	vehicle that carries corn to the elevator	soft hairs on the ear

Corny Words

Answer Key

acre—area of land about the size of a football field
barn—a building for sheltering livestock and crops
bushel—a way to measure grain
cereal—made from corn and you eat it for breakfast
cob—the center of an ear of corn
combine—machine for harvesting grain
corn—a grain that grows on ears
cornfield—place where corn is grown
cow—large animal that eats corn
crop—agricultural product
cultivate—to prepare the land for crops
disc—machine used for turning over the soil
ear—part of the plant where kernels grow
elevator—warehouse for storing grain
export—to send products to other countries
fall—corn harvesting season
farmer—man or woman who manages a farm
fertilizer—material put on or in soil to improve plant growth
fructose—liquid sugar made from corn
gasohol—fuel made from processed corn
germinate—to sprout and begin to grow
grain bin—storage place for corn
kernel—seed of an ear of corn
hail—a weather condition that can damage corn
harvest—cutting and gathering grain from the field
hog—full grown animal that eats corn
husk—covering on an ear of corn
hybrid—a new corn plant made by crossing two others
maize—another word for corn
planter—machine pulled behind a tractor that plants corn
popcorn—a type of corn that will pop when heated
rain—moisture for corn
root—the part of the plant that grows underground
row—corn plants in a line
seedling—a young plant grown from seed
silage—harvesting the whole corn plant
silk—soft hairs on the ear
silo—storage for silage
spring—corn planting season
stalk—stem of a corn plant
tassel—the top of the corn plant that produces pollen
topsoil—most important layer of soil
truck—vehicle that carries corn to the elevator
worm—pest that chews on the corn plant
yellow—color and type of corn planted in Nebraska

Corny Words
Activity Sheet A

kernel	stalk	silo
corn	maize	crop
fall	rain	cob
farmer	barn	yellow
root	tassel	gasohol
hail	worm	spring
disc	husk	planter
fer-tilizer	cul-tivate	topsoil
bin	bushel	combine
acre	elevator	germinate
hog	harvest	ear
cow	popcorn	row
export	silage	hybrid
corn field	fructose	cereal
silk	truck	seedling

Subject Area: Science

Objective: The student will:

1. be able to demonstrate knowledge indicating soil is needed by all living things, including people.

Suggested

Grade Level: K - 2

Background: All living things have a need for soil.

Resources: Contact your local Soil Conservation Service or your local Natural Resources District.

Materials:

1. Large, unlined, recipe cards.
2. Chalkboard, chalk.
3. Crayons or other drawing media.
4. Drawing paper.

Procedure:

1. Have the students name all the living things they saw on their way to school this morning or the living things they saw the evening before while they were outside playing (i.e. leaves, grass, berries, moles, trees, bugs, worms, birds, bees, flowers, etc.) Make a list on the chalkboard. (A walk to a nearby park or around the school yard could be done before listing on the chalkboard).
2. Have students make pictures on large plain recipe cards depicting each living thing. There should be one card for each living thing listed on the chalkboard.
3. Make two categories on the board; "Needs Soil" and "Does not Need Soil". As the teacher holds up a card, have the students tell if the living thing needs soil. As the students agree it does need soil, tape it to the chalkboard in the proper category "Needs Soil". Have a card picturing boys and girls, put it in it's proper category. ("Needs Soil").
4. Discuss with student's that soil is important to all living things, including people.
5. Ask the children, "What do you think would happen if all of these things that are alive did not have soil to stand on, dig in, hide in, or eat?" The teacher could use a "magic" paintbrush painting each child into something different that's living. (Example: Jim, I'm going to paint you into

Procedure:
(cont.)

a tree.) Continue to assign a different role to each child. Ask the children to remember their new role as they listen to the following story.

It's a sunny day and there's no wind blowing. All you plants, dig your roots into the soil and feel how soft and warm it is. You ants are busy digging new homes in the soil. You bunnies are digging up some fresh orange carrots that are growing near by. You birds are pulling up worms, etc. Think about how you are using the soil. Is it important to you? What if there weren't any soil? What would you do?

Suddenly, you feel the earth beginning to shake. I am going to take out my magic paintbrush and paint myself into a giant bulldozer. As I rumble along, I push all the dirt out of my way. I'm going to build myself a big road right here. What's happening to all the living things that need the soil? What are they to do? As I rumble by, what happens to the trees? What about the bird in the tree? Where do they go? What can they do to live and eat?"

Read the story again allowing the children to react to their "painted" roles. Have the children sit in a sharing circle. Ask each child what happened to their living thing when the soil disappeared. How did they feel?

Guide the discussion toward the conclusion that living things need and depend upon soil for food, shelter, and support.

Have the children draw a picture of what they were before and after the bulldozer.

Subject Area: **Art**

Objective: **The student will:**

1. be able to use flour (a wheat product) to make a paper-mache farm animal.

**Suggested
Grade Level:** **K - 6**

Resources: Nebraska Wheat Board
 P.O. Box 94912
 Lincoln, Nebraska 68509
 Phone: (402) 471-2358

Materials: 1. Flour
 2. Water
 3. Newspaper
 4. Balloons (large and small)
 5. Paper towel tubes
 6. Masking tape

Procedure:

1. Mix 1 cup flour and 1 cup water until you have a creamy paste. (Add more water if it seems thick.)
2. Blow up 1 large balloon for each animal's body and 1 small balloon for each animal's head.
3. Rip newspaper into strips. You will need larger strips (approximately 2 x 6 inches) and smaller strips (approximately 1 x 3 inches). Don't cut the newspaper, be sure to rip or tear it.
4. Dip the large newspaper strips one at a time in the flour paste. Be sure to get the paste on both sides of the strip. Rub the strip between your fingers to take off extra paste. Lay strips over each balloon until balloon is completely covered, smoothing each strip as you put it on. Let balloons dry.
5. After balloons are completely dry, tape the head to the body.

(cont.)

Procedure:
(cont.)

6. Make legs from paper towel tubes and tape on to the body. Make ears, nose, horns, or tails out of the paper towel tubes or cardboard. Tape them to the head or body.
7. Make a new batch of paste. Paper-mache the legs and other features. Let dry.
8. Pop balloons with a pin.
9. Make another batch of paste. Cover entire animal with another layer of paper-mache. Let dry.
10. When completely dry, paint the entire animal with tempera or poster paint. Glue yarn on the animal for tails or manes.

Additional Activities:

Cooking Experience - Play Dough

Use play dough to make a farm animal from wheat (flour).

2 1/2 cups flour

2 cups boiling water

1/2 cup salt

food coloring

1 tablespoon alum

2 tablespoons cooking oil

Mix the flour, salt, alum and cooking oil together. Add the boiling water and food coloring. Stir the dough with a spoon, then knead the play dough. Add more flour if the dough is sticky. Knead the dough each time flour is added.

Additional Activities:
(cont.)**Cooking Experience - Bread In A Bag**
Bulgar Honey Bread

1 cup bulgar wheat (dry)



1/2 cup honey



1 tablespoon salt



1/4 cup warm water



3 cups boiling water



2 tablespoons cooking oil



2 packages dry active yeast



6 1/2 to 7 cups enriched all-purpose flour



Combine bulgar, boiling water, honey, oil and salt in a 2 gallon Ziploc freezer bag. Cool to lukewarm. Add yeast to warm water. Let stand a few minutes, stir to dissolve. Add to cooled bulgar-honey mixture. Add flour in 3 parts, knead in a bag each addition until dough leaves sides of bag. (Dough will be soft.)

Add a small amount of flour to aid in kneading. Knead until smooth, elastic and does not stick when pinched with fingers (about 5 minutes). Place in greased bowl turning to grease all sides, cover with waxed paper and a towel. Let rise in warm place until double in size (about 2 hours).



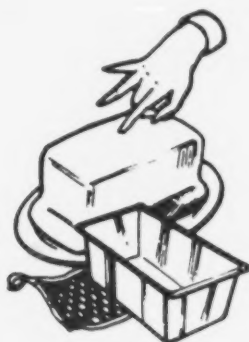
Additional Activities:
(cont.)

Cooking Experience - Bread in a Bag

Punch down and divide dough in half. Shape into loaves.
Cover and let rise until double (about 1 hour).

Bake at 350 degrees Fahrenheit for 40 to 45 minutes or
until done. Place on wire racks. Brush with butter.

Yield: 2 loaves.



Ag in the Classroom --- --- **From Hen to Home**

Program

Subject Area: Social Studies, Science and Art

Objective: The student will:

1. become familiar with and demonstrate their understanding of the steps of egg production.
2. use scientific methods of observing and recording to draw conclusions of which egg is raw and which is cooked.

Suggested

Grade Level: 3 - 6

Background:

The following terms are associated with the steps of egg production:

1. Laying

Today, hens no longer roam a farm yard freely. They are kept in a controlled environment so that their diet and production schedule can be regulated.

2. Collecting

In many operations, the eggs drop automatically from the hen's cage to a conveyor belt below.

3. Washing

All eggs are washed automatically before any other steps in the process.

4. Treating

Since washing the eggs removes their bloom, the natural protective covering, they are sprayed with a tasteless, odorless, harmless and invisible oil. This reseals the pores and slows down aging even better than the original bloom.

5. Candling

The eggs are passed over intense light and rotated mechanically so that the contents can be examined without cracking the shell. A candler checks for cracks in the shell, the size of the air cell, and the condition of the albumen and yolk. Inferior eggs, or undergrades, are removed.

6. Grading

The eggs are graded as U.S. Grade AA (Fresh Fancy), A, or B. Grades AA and A are preferred for poaching, frying, and cooking in the shell because of their superior appearance.

Background: 7. **Sorting**
(cont.)

The eggs are also sorted according to size. Government standards have established the minimum weight per dozen; Jumbo, 30 oz.; Extra Large, 27 oz.; Large, 24 oz.; Medium, 21 oz.; Small, 18 oz.; and Pee Wee, 15 oz. A dozen large eggs weighs at least one and a half pounds.

8. **Packing**

Finally, the eggs are placed in cartons marked with the appropriate size and grade. The cartons are specially designed to minimize breakage.

9. **Cooling**

The temperature of the eggs is lowered to 45 degrees Fahrenheit to insure their freshness. Eggs kept at room temperature would lose more quality in one day than they would lose in one week in the refrigerator.

10. **Shipping**

The eggs are shipped in refrigerated trucks and delivered to the stores. The entire process takes about 36 hours and sometimes less than 24 hours.

11. **Selling**

The stores keep the eggs in refrigerated display cases to help maintain their freshness.

12. **Storing**

At home, the eggs keep best in their original carton on a shelf. The egg keeper slots in the door of some refrigerators are subject to warm drafts whenever the door is opened so it's best not to store them there. Properly stored, the eggs will remain fresh at least four to five weeks.

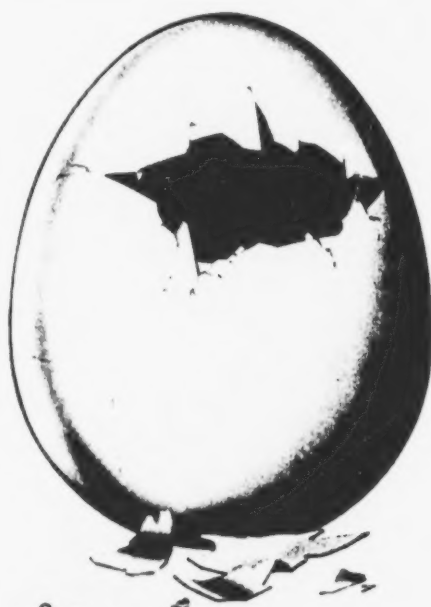
Resources:

Nebraska Poultry Industries, Inc.
Doyle Free
211 Mussehl Hall
University of Nebraska
Lincoln, Nebraska 68583-0802
Phone: (402) 472-2051

Materials:

1. Worksheets A, B, and C
2. 4 raw eggs
3. 4 hard-cooked eggs
4. flashlight
5. crayons

- Procedure:**
1. Have the students complete Worksheet A. To complete Worksheet A, they must number the pictures to show the correct order, 1-12. Then trace the steps through the maze until the egg reaches their home.
 2. Discuss the steps the egg went through to get from the hen to their homes.
 3. Label the hard-cooked eggs "A" and the raw eggs "B". Set the eggs and the flashlight in a darkened corner of the room.
 4. To introduce the next activity, explain that you have eight eggs. You have cooked four eggs, and four are raw, but you do not remember which were the cooked and which were raw.
 5. Send the students in pairs or small groups to the corner to complete Worksheet B. While students are waiting to go to the corner or waiting for others to finish in the corner they can be completing Worksheet C.
 6. After all students have experimented with the eggs, discuss their answers. The only reliable difference between the eggs is spinning them; the raw egg is slower because the liquid sloshing inside the egg creates a resistance as it hits the walls. The hard-cooked egg spins faster since no braking force is counteracting the momentum.



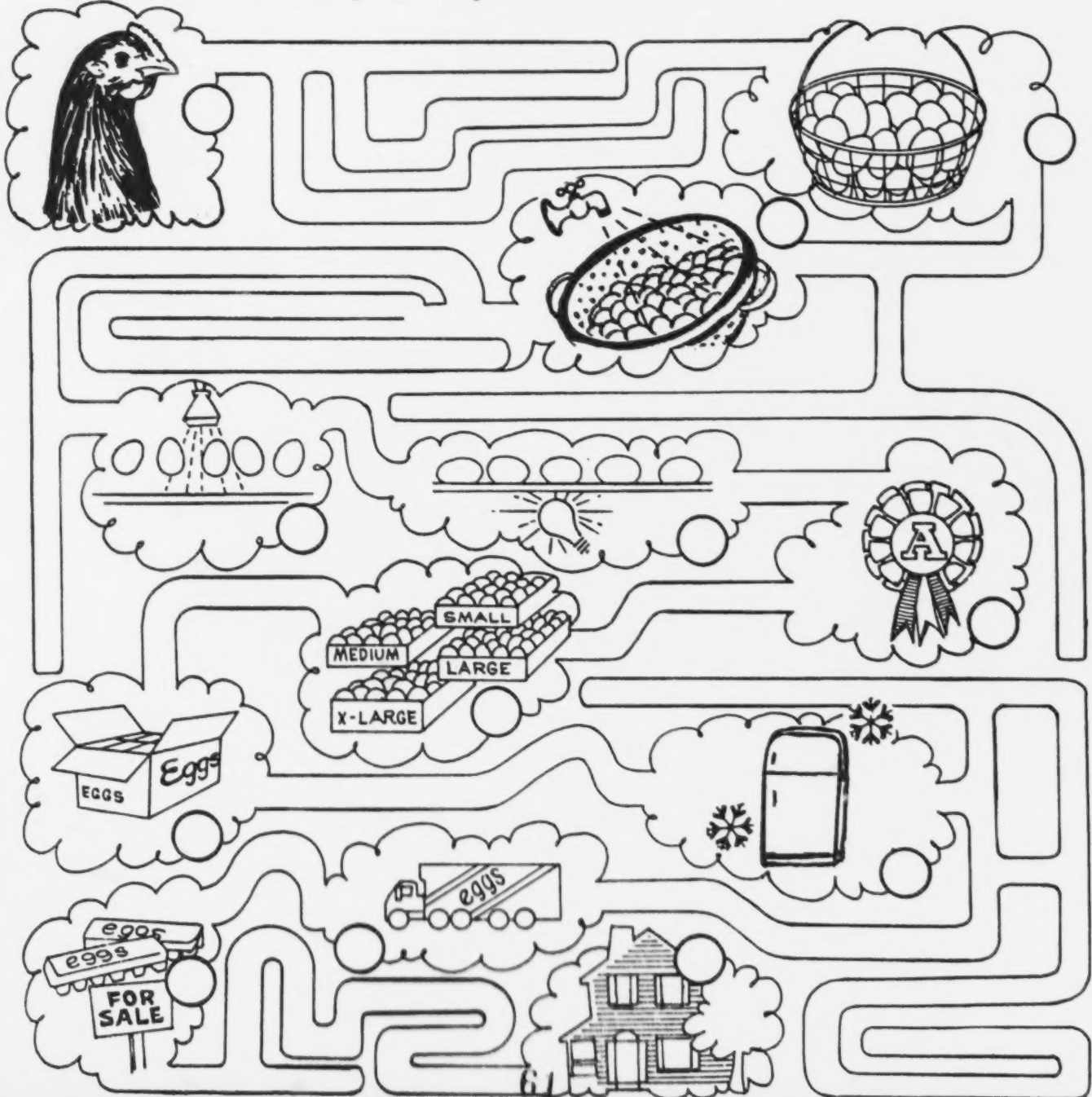
From Hen to Home Worksheet A

Below are the steps that an egg follows on the journey from the hen to the home.

- | | |
|---------------|--------------|
| 1. Laying | 7. Sorting |
| 2. Collecting | 8. Packing |
| 3. Washing | 9. Cooling |
| 4. Treating | 10. Shipping |
| 5. Candling | 11. Selling |
| 6. Grading | 12. Storing |

Number the pictures to show the correct order. Then trace the steps through the maze until the egg reaches your home!

Don't get lost along the way!

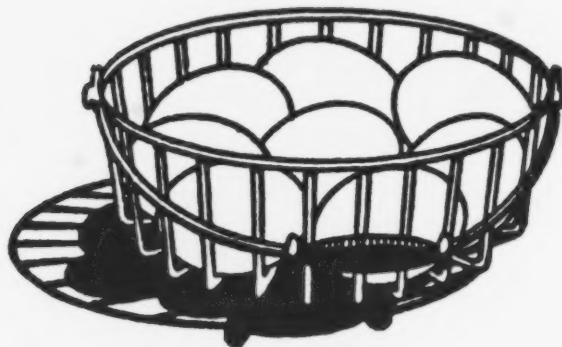


Raw or Hard Cooked ?

Directions: Using the eggs answer the following questions.
Be careful so you do not crack or break the eggs!

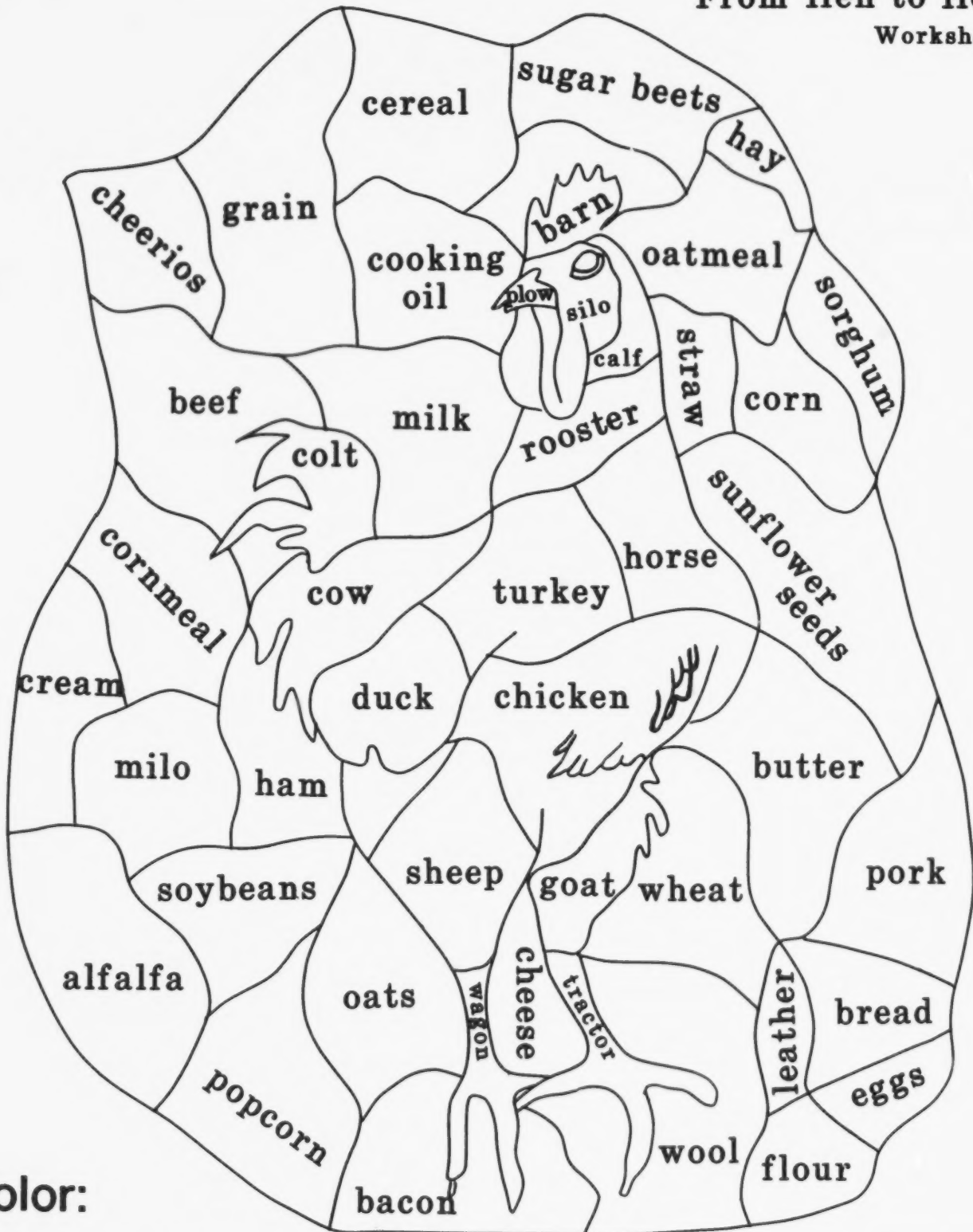
1. Look at both eggs closely. Do you see anything that tells you which one is raw?

2. Shake each egg carefully. Can you feel a difference? _____
If you can, which is raw? _____
3. Hold each egg in front of the flashlight. Does more light show through one of them? _____
_____ If so, which one? _____
4. Spin each egg on the floor away from tables and chairs. Do they spin the same? _____
If not, which one was slower? _____
Do you think the slower egg is hard-cooked or raw? _____



From Hen to Home

Worksheet C



Color:

Farm Buildings RED

Crops BLUE

Farm Machinery YELLOW

Food Products BLUE

Animals WHITE

63

Other Products BLUE

Subject Area: Science, Math

Objective: The student will:

1. illustrate how much of the earth's surface can actually be used for food production as compared to how much of the earth is ocean, deserts, mountains, swamps, etc.
2. be able to make a graph depicting the portion of the earth used to grow our food versus the other areas of the earth such as water or various land regions.

Suggested

Grade Level: K - 6, modifying to fit appropriate grade level.

Background: One of the most important natural resources that covers much of the earth's land surface is soil. All living things depend on it as a source of food, either directly or indirectly. The amount of land used to produce food remains the same, yet the world population continues to grow. This generation needs to use the soil wisely to insure the future for food production to feed the world. This activity uses an apple to illustrate the amount of the earth's surface that can be used for food production.

Resources: Contact your local Soil Conservation Service or the local Natural Resource District.

Materials:

1. a large apple
2. a paring knife
3. paper (to make the graph)
4. crayons or colored pencils (to make the graph)

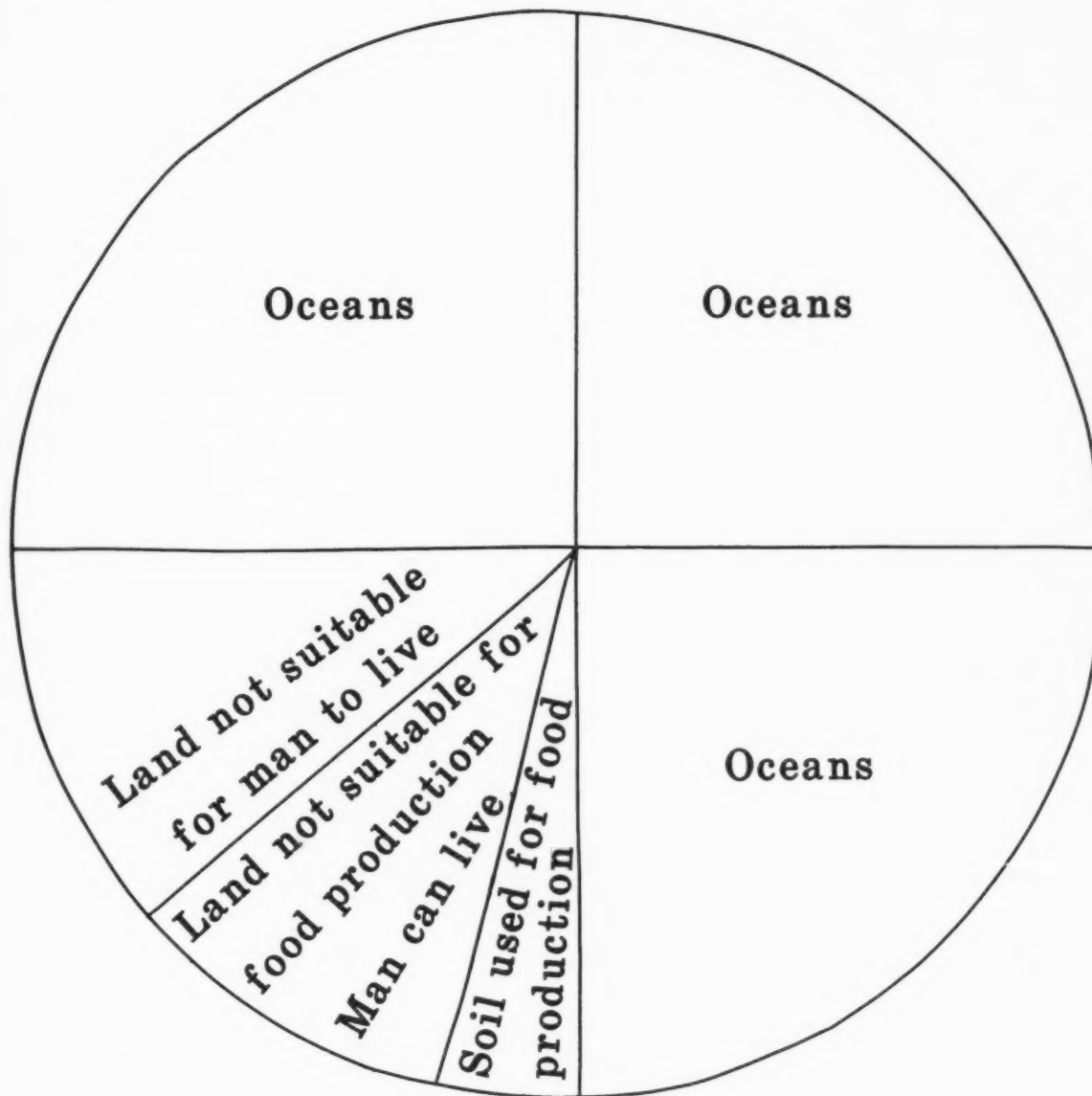
Procedure:

1. Cut the apple into four equal parts. Three of the parts represents the area of the earth that oceans (or salt water bodies) cover. The fourth part represents the area of the earth that is land.
2. Cut the land section in half lengthwise, creating two one-eighth pieces. One of these pieces represents land such as desert, swamp, antarctic, arctic and mountain areas that are not suitable for man to live.
3. Take the other one-eighth section (which represents the areas that man can live on, but may not grow food) and slice it lengthwise into four equal parts (they will be thin). Three of these one-thirty second sections represent the areas of the earth which are too rocky, too wet, or too hot, for the production of food or are occupied by cities, factories and highways. Man can live in these areas.

Procedure:
(cont.)

4. Carefully peel the last one-thirty second section. This bit of peeling represents the amount of soil which is used for the production of food that feeds the world.
5. Discuss what this soil is used for. Some possible discussion questions might include: What would we do if the valuable soil we depend on for food should suddenly disappear? What do we need to do if the earth's population continues to grow while this amount of valuable soil remains the same?
6. Have the students create a graph depicting the portions of the earth demonstrated earlier in this activity. The graph can be done individually in small groups or as a class. (Refer to Answer Key A).

Areas of the Earth's Surface





AMARANTH



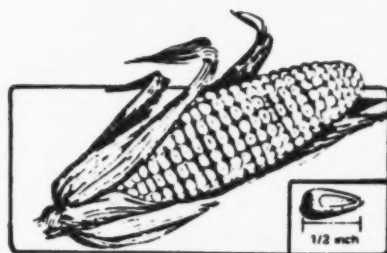
WHEAT



BARLEY



PROSO MILLET



CORNMEAL

Nebraska
Ag in the Classroom
Program

GRAINS AS FOOD

-abridged-



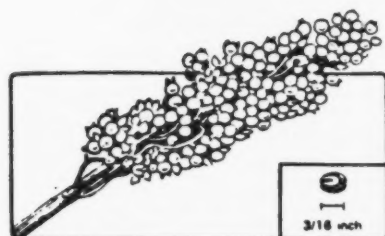
RICE



BUCKWHEAT



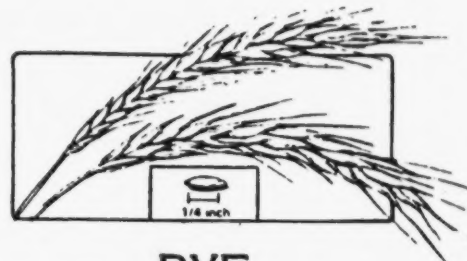
POPCORN



SORGHUM



OATS



RYE

GRAINS AS FOOD

-abridged-

Anna Mae Brenner, Extension Food Service Mgt. Specialist
Harriet Kohn, Extension Food & Nutrition Specialist
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GRAINS AS FOOD

and includes recipes using each of these grains.

INTRODUCTION

Sorghum, buckwheat, proso millet, barley...these are just a few of the many grains that can be used by today's consumers for preparing cookies, cakes, soups, casseroles and many other dishes. Cookbooks seldom mention these less common grains.

Of the eleven cereals and other grains described here all but three, amaranth, barley and rice, are important to the economy of Nebraska. (amaranth grows here but is considered a weed). Recent increases in production of grains and research on their uses for human consumption have both contributed to the public interest in, and desire for information on, grains as food.

The various cereal grains have very similar structures. They contain three basic parts; the bran, endosperm, and germ. The bran is the outside protective cover of the grain. The endosperm, which is the middle starchy area, provides energy in the form of carbohydrate to the germinating plant. The germ, also called the embryo, is the part which develops into a new plant. The embryo contains oil and protein.

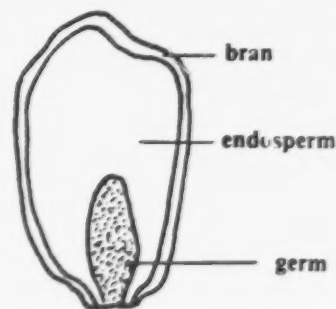
The oils are the most efficient form of energy storage for the plant, but oil can become rancid. Once milled in-

to flour, the germ may become rancid quite rapidly. Therefore, the germ is usually removed during processing.

The endosperm protein "gluten" which occurs in many cereal grains (see chart on gluten content) contributes significantly to the "rising ability" of their flours. It is also a substance to which some people are allergic.

The bran is sometimes removed because of its dark color and coarse texture. However, many nutrients contained in bran are lost by this removal. Though the resulting flour is white it has to be "enriched" if the nutrient value is to approximate the original whole grain product. Many people now want the bran to be ground along with the endosperm so nutrients are not lost.

Diagram of wheat grain



REGIONS OF THE WORLD WHERE CEREALS ARE GROWN

KEY: Major Crop 2, Minor Crop 1, No Crop 0

Specific Areas	North America	South America	Western Europe	Eastern Europe & Russia	Africa	Middle East	Far East	Australia & Oceania
Amaranth	1	No	Cultivated	Crop				
Barley	1	1 (2-Eastern Pampas)	2	1	1	1	(1-Upper Ganges Plain) (2-Yangtze Basin)	1
Buckwheat	1	0	0	2	0	0	(1-China)	0
Corn	2	1 (2-Eastern Pampas)	1	2	1 (2-Nile Valley) (2-Maize Triangle)	1	1-2	1
Oats	2	0 (1-Eastern Pampas)	2	2	1	1	1	1
Popcorn	1	No	Cultivated	Crop				
Proso Millet	2	1	1	2	2	1	2	1
Rice	1	1	1	0	1	1	2	1
Rye	1	1	2	2	0	1	0	0
Sorghum	2	1	1	1	2	1	2	0
Wheat	2 (2-Eastern Pampas)	1	2	2	1	2	2	2

AMARANTH

FAMILY: *Amaranthaceae*

GENUS SPECIES: *Amaranthus cruentus*



History and Botany

Amaranth is a very old plant that has received a lot of attention in recent years. Botanically, it is not a cereal grain (all the cereals are members of the grass family, Gramineae), but rather a relative of the common pigweed. It grows in many parts of the world, often as a weed. A vegetable variety, producing large leaves much like spinach, is grown and eaten in parts of India. However, the recent interest in this country has been in the grain type. The ancient Aztecs grew large amounts of grain Amaranth, but the practice was banned by the Spanish conquerors of Mexico because of its association with sacrificial religious rites.

Contrary to much of the popular press, the nutritional quality of amaranth grain is not vastly superior to that of many of the other grains. Its protein content is only slightly higher than hard red spring wheat, and its protein quality is about the same. Amaranth contains a higher percentage of lysine in its protein than does wheat, but it is inferior to wheat in some other respects. The oil in amaranth seed is higher in polyunsaturated fatty acids than the oils from any other grains. However, the amount is so low that it probably would not be a significant contribution to the diet.

Availability, Processing, and Storage

Amaranth is available in only a few health food stores, and by mail, but has been attracting an unusual

amount of attention. Many people are growing their own amaranth. It grows relatively well on poor soil, requiring less water, fertilizer, and care than the grains we are more familiar with. The very small seeds (less than 1/16 inch in diameter) are borne in brush-like clusters at the top of large-leaved plants about three feet high. After the crop matures and turns dry, the seeds may be threshed and stored for over one year if kept dry. Because of its oil content, however, amaranth flour, like most other whole grain flours, should be used immediately after milling or stored under refrigeration.

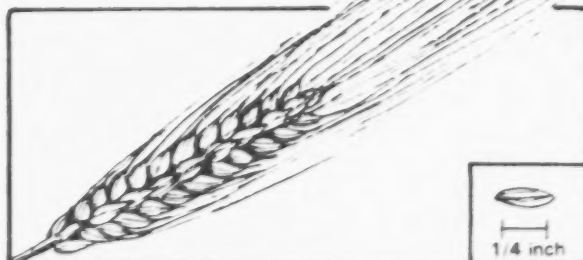
Cooking Characteristics

Amaranth starch has a higher water binding capacity than does wheat starch, and it gelatinizes at a higher temperature. Amaranth starch is like a "waxy" cereal starch or tapioca starch, in that it thickens but does not set into a firm gel upon cooling. The protein in amaranth does not contain gluten, so it cannot be used by itself to make light yeast-leavened foods. Amaranth may be eaten as a whole grain, cooked cereal, or popped for a snack, and it may be milled from a flour and mixed with wheat flour in baked foods (about one-fifth amaranth and four-fifths wheat flour), or it may be mixed with vegetables and batters.

BARLEY

FAMILY: *Gramineae*

GENUS SPECIES: *Hordeum vulgare*



History and Botany

Six row barley, *Hordeum hexatichum*, was found in the earlier sites of Mesopotamia, Egypt, and Cilicia in 5000 B.C., Western India and Greece by 3000 B.C., and in Europe by the 10th century. It is a widely adopted crop and can produce a reasonably good yield of grain under poor soil and moisture conditions. Today, in

Europe and North America, it has been replaced by wheat and rye. In the United States, the major use of barley is for the production of malt, used in alcoholic beverages. Minnesota, North and South Dakota, California, Wisconsin, and Nebraska are the chief barley producing states. Barley as bread was part of the diet of David's army (II Samuel 17:28). It was used before wheat and rye.

Availability, Processing, and Storage

Pearled barley, in regular and quick forms, is found in most supermarkets. Pearled means that the barley has the outer hull removed from the grain kernels by abrasive action. Barley hulls do not soften, even with long hours of cooking, so barley is sold only after being pearled. Scotch barley is husked grain, roughly ground. Barley flour is made by grinding the "pearls."

Pearled barley and flour should be stored in a metal or glass container with a tight fitting lid. Keep in a dry area at room temperature or under refrigeration.

Cooking Characteristics

Malted barley has been allowed to sprout for a short period and then dried. It is used as a flavoring agent for

cereal breakfast foods and for malted milk. Small amounts of malted barley are used by commercial bakers in bread doughs to promote active yeast fermentation.

Instant pearl barley can be added to boiling water to make a hot granular cereal in 10 minutes. Regular pearl barley has been used in Scotch broth and other soups which need to cook slowly for an hour or more. Barley flour contains some glutenlike protein. While the gluten is not strong enough to make good bread by itself, it may be enough to affect those people allergic to wheat flour. In recipes, substitute barley flour for 1/4 of the wheat flour. In substitution for 1 cup of wheat flour use 1 1/4 cups of barley flour. It can give a moist texture (like cake) to quick breads.

BUCKWHEAT

FAMILY: *Polygonaceae*

GENUS SPECIES: *Fagopyrum esculentum*



History and Botany

Buckwheat is not a wheat at all, for it is not one of the true cereal grains, which are members of the grass (Gramineae) family. Rather, it is a herbaceous plant. The fruit (so-called seeds) can be used in much the same way as the cereal grains, so many people think of it as a cereal. The triangular shape seeds are covered with a dark, gray hull which can be removed by commercial milling equipment. Their shape resembles a miniature beechnut; hence, our name, derived from the German buckweizen, or "beechwheat."

Buckwheat has been a staple food in China for over 1,000 years, and has been grown in Europe for over 500 years. Today, it is still a staple food in Eastern Europe and in Russia, where millions of acres are grown. Much buckwheat was grown in this country a century ago, and is now enjoying a rebirth in this decade, following a steady decline in popularity for many years. Interest in this new-old world food has increased substantially since the 1970s and a rebirth in interests for natural foods. The plant likes a cool, moist climate. It will grow almost anywhere, even in poor, arid soils, and matures in only 60 days.

Availability, Processing, and Storage

Pennsylvania and New York are especially known for their buckwheat production, but the growing area has been expanding in recent years, and moving westward into the Michigan to Minnesota area. It is available in a

few large grocery stores, as well as in food coops and health food stores. In addition to the ubiquitous buckwheat pancake mix, you can buy the dehulled seed, or groat, both in the whole and cracked forms, and as light and dark flours. Buckwheat is very bland in its natural form and is often roasted to develop its characteristic nutty, strong flavor.

Home-ground flours usually contain a high level of the hull, resulting in a very dark gray appearance. The whole grain will keep for a year, and commercially milled flours may be stored for several months, if kept dry and cool. All homemilled flour should be refrigerated if it is not going to be used within a few days.

Cooking Characteristics

Kasha is the Russian name for cooked buckwheat, and is the term used in Jewish cookery for a thick porridge made by boiling cracked groats. The bland, unroasted groats may be used for stuffings or pilafs, much like rice, or for a cooked cereal much like Cream of Wheat. The light flour can be used in baked goods and sauces, often in combination with wheat flour, and the strong, dark flour is usually used alone for pancakes.

The light flour is a relatively easily digested cereal for babies or invalids. Because buckwheat is not a wheat at all, it does not contain gluten and may be eaten by many people who are sensitive to the proteins in wheat flour. Because it lacks these dough-forming glutens, however, it cannot be used to make traditional light breads.

CORNMEAL

FAMILY: *Gramineae*

GENUS SPECIES: *Zea mays*

History and Botany

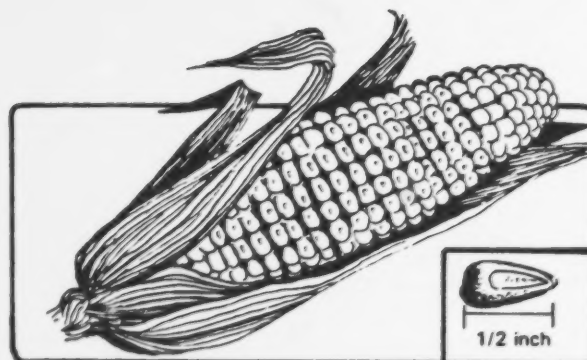
Corn, known as Maize in most of the world, botanically named *Zea mays*, is a native of America. Indians grew white, yellow, red, and blue corn for 2,000 years before Columbus landed. Since then corn has become one of the world's most important crops. It can be made into many basic food products. One of these products is cornmeal. Cornmeal is made by grinding white or yellow corn.

The corn kernel consists of four basic parts: the hull which is a hard covering on the outside of the kernel; the soft endosperm which is made into corn flour; the hard endosperm which is made into cornmeal and grits; and the germ which is the soft and oily portion of the kernel.

Availability, Processing, and Storage

Corn is available almost all over the world. Cornmeal and grits can be purchased in grocery stores, small mills, or from health food stores.

The corn kernels are processed to produce a variety of products. First the kernels are cleaned and steamed. The



hull and germ are removed. Removing the germ, which is high in fat and can become rancid, increases the shelf life of the corn products. The endosperm is then broken into granules. The large size granules are called grits, the medium ones are called cornmeal, and the finest are used for corn flour. Cornmeal can be stored tightly covered on a cool shelf for 4 to 6 months or longer refrigerated.

Cooking Characteristics

Since cornmeal and grits are not made from the whole grain, they can be enriched with niacin, riboflavin, thiamin, and iron in the same amounts as found in enriched white flour. Be sure to purchase the enriched cornmeal or grits since unenriched forms are available, too. Cornmeal and grits can be used to make hot cereal. The cornmeal or grits should be mixed with cold water and then added to boiling water while stirring. This helps prevent lumps. Follow the directions on the package. Cornmeal can be used in main dishes, breads, cookies, and puddings. A light sprinkling of cornmeal under bread dough helps prevent sticking.

OATS

FAMILY: *Gramineae*

GENUS SPECIES: *Avena sativa*

History and Botany

Oats, *Avena sativa*, is a whole grain used to make rolled oats. Oats originated in western Europe from two varieties of wild oats—the common and the red. Now they are grown in northern climates of Europe and North America. Oats have been an important staple food in Scotland and their Scottish Oatcake is famous. Our familiar rolled oats was originated by Alexander Hornby of New York.

Availability, Processing, and Storage Time

Before hulling, oats are dried and toasted. Then the hulls are removed and the groats are rolled into finished flakes. Quick cooking oats are divided into smaller



flakes to reduce the cooking time. Regular or "old fashioned" oats are left whole. Many types of processed oat products are available including uncooked and ready-to-eat oat cereals. Scotch oatmeal (coarsely ground), oats groats, and oat flour are available in specialty stores. Rolled oats can be stored for 3 months tightly covered on a cool shelf or longer if refrigerated.

Cooking Characteristics

Oats have many uses in cooking in addition to being cereal. Oats can be used to extend the flavor of meat in meat loaves and casseroles. Oats add variety to breads and cookies and can be used to thicken soups, stews, and desserts. When oats are mixed with liquid ingredients the liquid combines with the starch in the oats and causes it to swell and thicken.

To make oatmeal, sprinkle rolled oats slowly into boiling water. This helps prevent lumping. Stir frequently while cooking. Follow the directions on the

POPCORN

FAMILY: *Gramineae*

GENUS SPECIES: *Zea mays everta*

History and Botany

There is evidence that popcorn may have been the first type of corn raised for human consumption. Ancient clay and metal poppers have been found in North, South and Central Americas. Popcorn was introduced to Europe by Christopher Columbus. According to legend, popcorn was introduced to the English colonists at the first Thanksgiving feast by Quadequina, brother of the chief. Commercial popcorn sales began about 1885 in the United States. The average consumption per person in the U.S. today is approximately 2 1/2 pounds or 40 quarts of popped corn. Two-thirds of all the popcorn produced in the world has been consumed at home. However, 85% of the movie theaters in the U.S. report popcorn sales as a profit maker. Popcorn has been recommended by the American Dental Association and American Diabetic Association as a delicious low calorie, low sodium, high fiber, and low sugar snack food.

Availability, Processing and Storage

Popcorn is readily available at most grocery stores, health food stores, and by mail. Nebraska has been the leading popcorn producing state in the U.S. The plant grows readily on most soils that are warm, arable and

package for length of cooking since the various types of rolled oats require different cooking times.



have available moisture. Development of hybrid popcorn has led to both white and yellow grain popcorn with less hull when popped. The popcorn stalks are smaller and shorter than regular corn stalks. When fully matured the ears are harvested, cleaned and shelled. Kernels that are sealed from the air in plastic bags, jars or cans will keep for over a year without refrigeration if stored in a cool dry location.

Cooking Characteristics

Moisture content for the greatest popping expansion varies from 13% to 14.5%. Too dry kernels may only split partly open or remain unpopped. Too moist kernels pop into pieces that are small, jagged and tough. If popcorn is too dry, one tablespoon of water per quart of kernels will raise moisture approximately 1 1/2 per cent. The best popping temperature is between 400°F to 500°F. Generally, the best results with oil requires 1/3 cup oil for each 1 cup of kernels. Salt should not be added to the oil as it pits heating surface. Popcorn may also be popped in hot air poppers without oil. Popcorn may be eaten popped without salt or with added seasonings. It can be used in desserts, meat products, etc. Popped corn ground into flour can be a low calorie substitute for flour in baked products.

PROSO MILLET

FAMILY: *Gramineae*

GENUS SPECIES: *Panicum miliaceum*



History and Botany

Millet is the common term for a number of small seeded annual cereal grasses in the family Gramineae, especially adapted to hot, dry climates. They have been grown since prehistoric times, extensively cultivated for man, birds, and animals. While they are not common human food in this country, the millets, along with sor-

ghum, are the staple foods for over two hundred million of the world's poorest people. They serve as a reliable food supply because, though lacking the high yields and other desirable properties of wheat and rice, they will almost always yield a crop, even during a severe drought. Over 34 million metric tons (75 billion pounds) per year were being harvested in the late 1970's.

Availability, Processing, and Storage

Proso, or common, millet is grown in this country, especially in western Nebraska. Generally sold as a bird seed, it is becoming more widely available in food coops and health food stores. You will want to buy the dehulled type for most food uses. The hulls are quite hard and fibrous and make it difficult to cook the grain to the desired degree of tenderness.

Be sure to clean or wash non-dehulled seed thoroughly before using it. Millet may be used as a flour, or as the whole grain. You may grind your own flour with a coffee mill or the small plate or stone mill sold by coops and health food stores for that purpose. You should grind your flour as fine as possible, and make it fresh each day. Like all home-milled whole grain flours, it should be refrigerated if it is not going to be used within one or two days. The oil naturally present in the germ has been smeared throughout the flour by the milling process, and this causes the flour to turn rancid rapidly.

RICE

FAMILY: *Gramineae*

GENUS SPECIES: *Oryza sativa*

History and Botany

Rice is the world's greatest crop, the staple food of over half the human race. Its importance can hardly be exaggerated. Rice was being cultivated in southeast Asia in 3,000 B.C. The word for "rice" is the same as the word "food" in some languages. In one Chinese dialect, "rice-culture" is the same as "agriculture." The growing of rice, the success or failure of the crop, affected the history, art, literature, ceremonials, and the intimate life of the peoples of both India and China. The largest rice producing countries are still India and China.

Rice culture is unique in that it grows in paddies of standing water, in the rich delta soil of rivers, or in irrigated land. Some "upland" varieties also exist. Rice was first brought to America from Madagascar in 1685. Arkansas, Louisiana, Mississippi, Texas, and California produce 99% of the U.S. crop. *Wild rice* is the grain of a different plant, a reed-like water plant.

Availability, Processing, and Storage

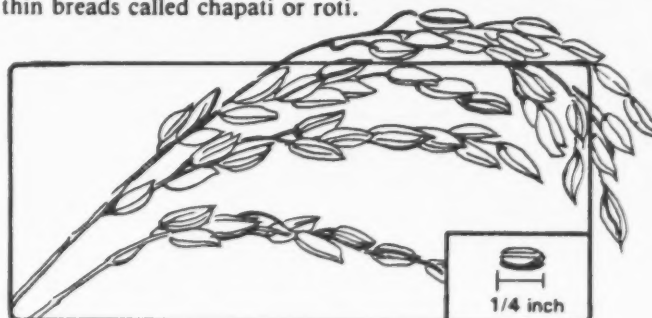
Most of the world's rice crop is consumed as an intact polished grain. Rice grains are rubbed against abrasive discs, to remove the hull and leave the underlying kernel, which is *brown rice*. Further rubbing polishes the grain to the white glossy finish or *polished rice*. Rice may be long, medium, or short grain, depending on the variety. Whole grain rice that has been steeped in hot

Unground millet may be stored for several months if kept dry and cool.

Cooking Characteristics

Proso can be used in many ways. Millet flours do not contain the special gluten forming proteins present in wheat. So, they cannot be used by themselves to make the light, white, bland bread and pastries familiar to the American palate. They can be blended (about one-fourth of the total flour) with wheat flour to produce baked foods with an appealing flavor and texture.

Most of the people who eat millet as a staple food consume it in one of three forms largely unfamiliar to Americans. It may be boiled whole or eaten much like rice. It can be ground into a coarse meal and cooked into a thin gruel or a thick paste. Also, millet is made into a stiff dough which is flattened and baked into very thin breads called chapati or roti.



water or steamed, then dried before the removal of the husk and polishing, is known as *parboiled* or *converted rice*. This treatment results in retention of 70-90% of water-soluble nutrients. The nutritional value of converted rice is intermediate between the brown rice and polished rice. *Enriched rice* is white or polished rice to which vitamins and iron have been added. *Rice starch* and *flour* are used in products such as pancake flour and by persons who are allergic to wheat. *Precooked rice* is long-grain rice cooked, rinsed, and dried by a patented process. This type of rice needs little preparation. Dry rice can be stored for long periods of time, especially if kept cool.

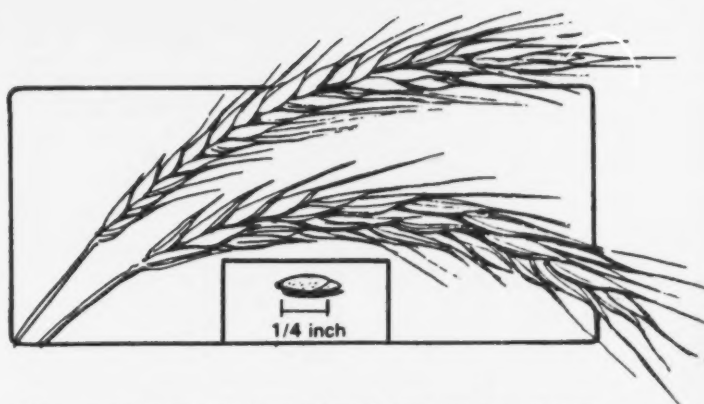
Cooking Characteristics

The variety of rice grain (short, medium, or long) used in cooking depends on personal preference. The varieties of rice tend to vary in stickiness. Each of these, whether polished, enriched, parboiled, or brown may be cooked in a variety of ways. Rice can be boiled, steamed, oven-cooked, or fried. Uncooked white, parboiled, or brown rice, yields 3-4 cups of cooked rice; 1 cup precooked rice yields from 1 cup to slightly more than 2 cups. To keep as many nutrients as possible in cooked rice follow these procedures: Do not wash rice before cooking. Packaged rice is clean. Use only the amount of water that the rice will absorb during cooking. Do not rinse rice after cooking.

RYE

FAMILY: *Gramineae*

GENUS SPECIES: *Secale cereale*



History and Botany

Rye is a member of the grass family, and closely related to wheat. It is among the hardiest of the grains, able to thrive on poor soils and cool, damp climates. As a result it is grown extensively in Eastern Europe, Russia, and in Scandinavian countries for human food. The U.S. grows much less than other countries. In the U.S., it is used for cattle, either as a pasture or as a grain. Rye is not as ancient as barley and emmer and probably originated as a weed that was too difficult to kill so it was simply harvested with the rest of the crop. It was cultivated B.C. and was a major European crop of the Middle Ages. Its use was often accompanied by widespread cases of St. Anthony's Fire, poisoning caused by eating grain contaminated by the ergot fungus. While its use has been declining, it is still the most dependable grain for vast areas of the Old World.

Availability, Processing, and Storage

Rye flours, light, medium or dark, are often available in supermarkets. Health food stores usually sell the whole grain and occasionally a coarse mill, cracked kernels (grits), or rolled rye flakes. You may also grind your own rye flour from the whole grain in small mills often sold for that purpose by food coops. Whole grain may be stored for a year or longer if kept cool and dry.

Commercially milled flour should keep on the kitchen shelf for several months. Nearly all home-ground whole grain flours should be prepared fresh and used within a few days. They still contain the germ which is high in oil and, once ground, tend to go rancid rather quickly.

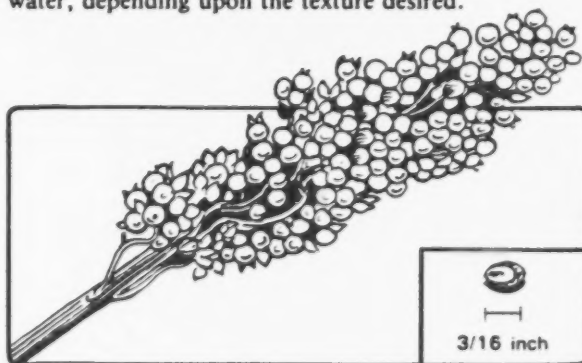
Cooking Characteristics

Most of the rye used for food in this country is used as a flour in rye bread, where it is normally blended with wheat flour, one-third rye to two-thirds wheat. The bread is often a caramel color and frequently contains caraway seeds for characteristic flavor. The heavy, coarse, black pumpernickel breads more nearly resemble the rye breads of Eastern Europe. Like wheat, rye contains the special gluten proteins necessary to hold gas cells so bread can rise. However, rye gluten is much weaker than wheat gluten. Your bread will be quite heavy unless you use a mixture of rye and wheat flours. In addition to the rye breads, whole rye is popular in crispy snack crackers. Rye has also been used in pancake flours. Rye has a much stronger flavor than wheat. Flakes and grits can be used for breakfast cereals, much like rolled oats and corn grits. They may also be used for stuffings. Like other dry cereal grains, each cup of rye flakes or grits will require two to three cups of water, depending upon the texture desired.

SORGHUM

FAMILY: *Gramineae*

GENUS SPECIES: *Sorghum bicolor*



History and Botany

Sorghum grain is a basic food for mankind in Africa and India because it can be grown in areas where wheat or corn fails from lack of rain and poor soil conditions. It was grown in Egypt as early as 2200 B.C. *Sorghum vulgare* has been raised in the U.S. for forage and sweet

sorghum syrup from the stalks. *Sorghum bicolor* has been adapted to the drier hot climate of the midwest and southwest U.S. for production of grain, where it is commonly called "milo." The grain is small and round like buckshot. It grows on a brush fibrous head, 10 to 14 inches long, at the top of the stalk. In another species

called "Broom-corn," the fibrous tops are used for brooms, after the grain is removed.

Availability, Processing and Storage

Sorghum may be purchased from elevators, if it hasn't been sprayed with pesticides. Some health food stores have a supply available. Choose the lightest colored grain, as often the darker the grain the higher the tannin content in the hull. Tannins complex with protein to inhibit its availability and may add a bitter taste. Sorghum may be ground in hand mills or food processors to the degree of fineness needed (coarsely ground for a cooked cereal, finely ground for flour). Hulls can be sifted from flour when grain is first cracked. Very little grain is milled commercially in the U.S. Flour should be prepared fresh and used within a few days. Whole grain,

if kept cool and dry, may be stored for over a year without becoming moldy or rancid. Store sorghum flour in metal or plastic containers with a tight lid.

Cooking Characteristics

Coarsely ground sorghum will soften when cooked in boiling salt water and will thicken into a gruel-like texture similar to whole rolled oats. It will not thicken and become firm like cornmeal mush when cold. The flour of sorghum lacks the gluten protein that is found in wheat. When substituted for wheat flours in yeast and quick breads, use one-third to one-half of the total amount of wheat flour as sorghum flour. It will give the bread a somewhat nutty flavor. Sorghum may also be popped like popcorn, to produce small tender kernels.

WHEAT

FAMILY: *Gramineae*

GENUS SPECIES: *Triticum aestivum*



History and Botany

Wheat belongs to the great family of grasses. It is the most widely grown and used grain in the world. A thousand varieties are grown commercially. They belong to the classification "*Triticum vulgare*" meaning common wheat. The kernel of wheat is a store-house of nutrients needed and used by humans since the dawn of civilization. It was probably grown first in southwestern Asia and introduced into the New World by Columbus in 1493. It was the staple food of the Egyptians, Greeks, Assyrians, and Romans. The invading armies of Alexander introduced it to northern India. Bulgur wheat, sometimes called parboiled wheat, is whole wheat that has been cooked, dried and partly debranned. It has been used in the Near East since Biblical days.

Availability, Processing, and Storage

Wheat is milled into flour. This flour is the basis of food in many forms—bread, rolls, crackers, biscuits, muffins, pancakes, breakfast cereals, macaroni, spaghetti, and noodles. *Whole-wheat flour*, entire wheat flour or graham flour are all names for flour ground from the entire kernel so that the natural constituents of wheat are all present.

White flour results from the milling (removal of bran and germ) and the sifting of clean wheat. This initial product is called "unbleached flour." A further process of whitening produces "bleached flour." All white flour is "enriched," i.e., thiamin, niacin, riboflavin,

and iron are added at a level set by law to approximate the original levels in whole wheat.

The bulgur form of wheat can be cooked as whole granules or it is "cracked" into fragmented form. Whole wheat grains and bulgur store well for long periods, but whole wheat flour tends to get rancid in hot weather. To prevent rancidity, persons who use whole wheat products, as in India, grind their flour fresh daily or at frequent intervals. White flour will keep well for longer periods. The nutrient composition of wheat varies slightly in different kinds of wheat. By comparing whole wheat and white flours, one can see that with enrichment they are very similar in value. Whole wheat still has the bran (or fiber) and contains slightly more protein than milled white flour. However, that bran may trap the vitamins, and one of its components, phytate, ties up the minerals. In effect, people may get more nutrient value from white flour products than from whole wheat.

Cooking Characteristics

Wheat flour is unique. Of all the grains, only wheat contains the two proteins, gliadin and glutenin, in just the right proportions so that when liquid is added to flour, and the mixture is kneaded, gluten is developed. It is gluten that gives baked products their porous structure and enables batters and doughs to hold the leavening gas that makes them light.

Bulgur may be used as an alternate for rice in many

recipes. It can be used as a hot, cooked cereal for breakfast; as a side dish with meat or fish; in bread products; or in main dishes, casseroles, or meat loaf.

Cooking methods for bulgur are similar to those for rice. Like rice, bulgur is not washed before cooking or

rinsed after cooking. Cook in just the amount of water that will be absorbed during cooking, i.e., 2 cups of water for 1 cup bulgur. Add bulgur and 1/4 tsp. salt to boiling water. Stir slightly until boil returns. Cover tightly, lower the heat, and allow it to cook 25 min.

Ag in the Classroom --- Grain Sorghum Program

Subject Area: Social Studies

Objective: The student will:

1. be able to gain a knowledge of a Nebraska product - grain sorghum (milo).
2. be able to follow directions.

Suggested Grade Level: 3 - 6

Background: Refer to "Grains as Food" pamphlet enclosed in "Library Books/Resource Materials" folder in this notebook.

Resource: Nebraska Grain Sorghum Board
P.O. Box 94982
Lincoln, Nebraska 68509
Phone: (402) 471-4276

Materials:

1. Worksheet A.
2. A sample of grain sorghum which could be obtained from a grain elevator in your local area.

Procedure:

1. Cut out each of the cards, on Worksheet A. Separate Answer Box from the questions. Read each question and choose your answer. Then line up the question card on one of the sides of the Answer Box so that the arrow points towards the Answer Box. Make sure that the edges of the cards are even; then follow the arrow to the correct answer.

Grain Sorghum

Worksheet A

 Cut out each of the cards below. Read each question and choose your answer. Then line up the question card on the side of the Answer Box the arrow points to. Follow the arrow to the correct answer!

1. Corn, wheat, soybeans, and _____ are Nebraska's four primary grain crops. A. alfalfa B. oats C. grain sorghum D. popcorn ↓	2. Most U.S. grain sorghum is used for _____. A. livestock feed B. baby food C. pancakes D. cat food →	3. Grain sorghum is the basic food for mankind in _____. A. Canada and Mexico B. United States C. Japan and China D. Africa and India ↑																
4. What type of climate is needed for grain sorghum? A. wet and cool B. hot and wet C. dry and cool D. hot and relatively dry ↓	5. The grain is small and round like _____. A. a kernel of corn B. a marble C. a buckshot D. a kernel of wheat ←	6. In the midwest and southwest U.S. grain sorghum is commonly called _____. A. wheat B. milo C. flax D. rye →																
7. The planting season for grain sorghum is _____. A. Spring B. Summer C. Fall D. Winter ←	8. The _____ is used to harvest grain sorghum in the fall. A. corn picker B. cultivator C. plow D. combine ↑	Answer Box <table border="1" style="width: 100%; height: 100%;"> <tbody> <tr> <td style="text-align: center;">B</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">D</td> </tr> <tr> <td></td> <td style="text-align: center;">C</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">A</td> <td></td> </tr> </tbody> </table>	B							D		C					A	
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Ag in the Classroom --- Liquid Measurement Cow Program

Subject Area: Math

Objective: The student will:

1. be able to understand certain measurements and how they relate to each other. These measurements are: gallons, quarts, pints, and cups.

Suggested Grade Level: 3 - 6

Resources: Dairy Council of Central States, offices located at:

Suite 103 Hillcrest Building
Ralston, Nebraska 68137
Phone: (402) 592-3355

4740 A Street
Lincoln, Nebraska 68510
Phone: (402) 488-0153

620 Badgerow Building
4th and Jackson Streets
Sioux City, Iowa 51101
Phone: (712) 252-2932

Materials:

1. Worksheet A.
2. pencils or crayons
3. overhead with transparency of Worksheet A or a blank transparency or a chalkboard.
4. markers or chalk.
5. Empty gallon, quart, and pint jugs. A one cup measuring cup.
6. Answer Key A (for reference).

Procedure:

1. Discuss measures you can buy milk in such as gallons, quarts, pints, 1/2 pints, etc.
2. Explain the gallon as a large unit of measurement. Have each student draw a body for the cow on Worksheet A and label it one gallon. (Follow Answer Key A as an example for the following directions).
3. Experiment with water and see how many quarts it takes to fill a gallon. Since it takes four quarts to make a gallon, draw four rectangles on the cow, two to represent arms (legs) and two to represent legs. Label each of these one quart.

Procedure:
(cont.)

4. Experiment with water to see how many pints it takes to fill one quart. Since it takes two pints to fill one quart, draw two pint rectangles to represent the rest of each leg (arm). Label each of these one pint.
5. Experiment with water to see how many cups are in one pint. Since there are two cups in one pint, draw two cups on each leg (arm) to represent hoofs. Label each of these one cup.
6. The drawing can be a reference to use for remembering liquid measurements.



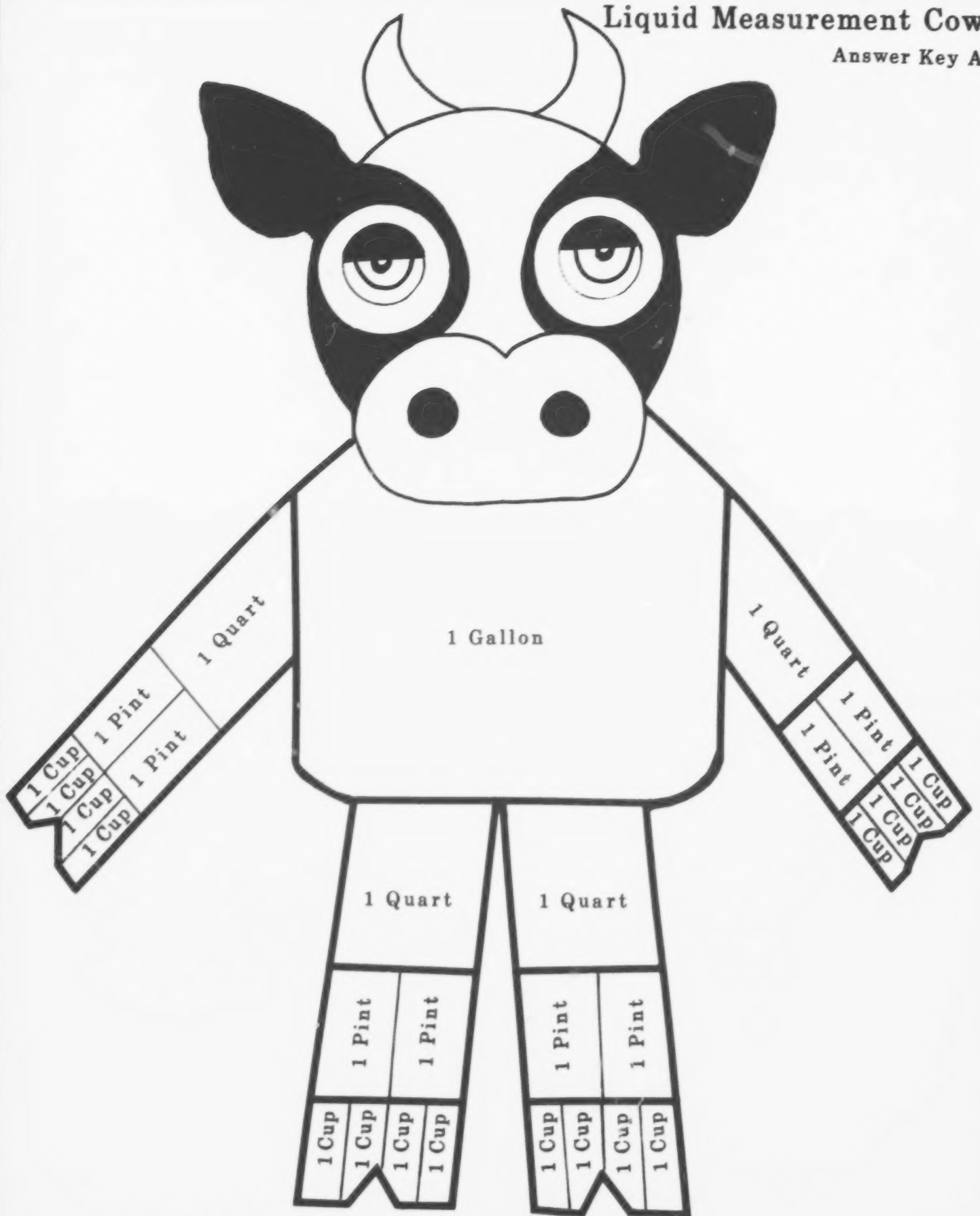
Liquid Measurement Cow

Worksheet A



Liquid Measurement Cow

Answer Key A



Ag in the Classroom --- The Living Soil Program

Subject Area: Science, Art

Objective: The student will:

1. be able to understand, appreciate and look for some of the creatures whose habitat is the soil.
2. be able to demonstrate knowledge indicating that soil is needed by all living things, including people.

Suggested

Grade Level: 3 - 4, can be adapted for any grade level, K - 6

Background:

Animal life in the soil includes protozoa, microscopic animals larger than bacteria; nematodes, larger and more complicated than protozoa but some still too small to be seen without a microscope; and earthworms, ants, snails, spiders, mites, and various other worms and insects. It is only specimens of this last group, and possibly some of the larger nematodes, that you will see in this study.

Earthworms are the most important group of the larger animals. They live in soils that are high in organic matter and not too sandy. The number of earthworms may range from a few hundred to more than a million per acre. Under favorable conditions between 200 and 1,000 pounds of earthworms may be present in an acre of soil.

The earthworms pass several tons of soil through their bodies each year and in so doing make certain nutrients available to plants. Burrows left by earthworms let water and air move through the soil.

Resources: Contact your local Soil Conservation Service or the local Natural Resource District.

Materials: This activity is best suited for spring or early fall.

1. Soil samples, enough for group or individual work. These samples can be taken from a pasture, a fence row, a woodland area (below leaves) a field, or garden. Collect samples 2-3 inches below the surface.
2. Magnifying glass for each student
3. White paper
4. Several small jars
5. Tweezers for each student
6. Paper
7. Glue
8. Soil
9. Pencils or crayons

Procedure:

1. Before this lesson, collect the soil samples or have students bring samples from home the day of the lesson.
2. Put the soil samples on white paper to make it easier to find things.
3. Have the students work in small groups or individually. They can carefully sort through the samples looking for small living things and other materials that can be found in soil.
4. As animal life is found, it can be sorted into the small jars for easier observation. Other materials found in the soil can be sorted on a separate piece of paper.
5. This activity can also be done by turning over a rock, log or board on the school site and observing animal life underneath.
6. Have students describe and discuss in detail what the creatures look like, where and how they live, what they eat, what eats them and their useful purpose.

Additional Activities: Soil Collage

Have students create a "soil collage". First have them sketch the animal life and other habitants they found in the soil. Color them. Spread glue over the soil area (omitting the insect drawings) and sprinkle soil over the glue. After the glue has dried, shake off the excess.

Ag in the Classroom --- The Not So Simple Spud Program

Subject Area: Social Studies

Objective: The student will:

1. be able to recognize products made from potatoes and their nutritional value.
2. be able to discover some history and interesting facts about potatoes.

**Suggested
Grade Level:** K - 4

Background: Did you ever wonder why potatoes are called "spuds"? That name comes from the three-pronged fork used to dig out the potato crops years ago in England and Scotland.

Although many people think the Irish grew the first potatoes, these interesting vegetables were grown in Peru more than 2,000 years before Columbus discovered America. The Incas made the first instant potatoes. They were left out to freeze on cold nights, then the water was squeezed from the potato during the warm day - a simple method of dehydration.

Spanish explorers brought potatoes back to Europe and soon they were popular in France, Italy, Germany, Russia, England, Ireland, and many other countries.

Sir Walter Raleigh recognized its potential food value and cultivated more than 40,000 acres of the plant in Ireland where the potato was well accepted and became a staple of the Irish diet. In fact, potatoes and buttermilk were the only foods readily available to the Irish during the early 19th century. Little did anyone realize that these two foods supplied a surprisingly well balanced diet. The buttermilk supplies vitamin A and calcium; the potatoes, many other nutrients.

Potatoes became so popular in Ireland that they became known as "Irish Potatoes". But the country's dependency on this vegetable created a famine when a blight hit the crops in the late 1840's. Many Irishmen then migrated to the United States, bringing with them their love of potatoes.

In the 18th century King Fredrick saw the potato as a solution to his country's famine and ordered all peasants to plant potatoes. Those who disobeyed were liable to have their noses cut off.

Ag in the Classroom --- The Not So Simple Spud Program

Background: (cont.)

One man associated with widespread acceptance of the potato was Antoine Auguste Parmentier. While a prisoner of war in Germany in 1757, Parmentier and many of his comrades survived on a diet of only potatoes. When he returned to his homeland of France he found his country deep in famine. Since the French were still ignoring the potato, Parmentier had to devise a plan to gain acceptance for the forbidden potato. He obtained a plot of land from King Louis XVI and began to cultivate potatoes, stationing guards around the potato patch each day to create the impression that whatever lay inside was very valuable. Each night he left the patch unguarded, and sure enough, the French began to pilfer the mysterious crop. Soon potatoes became the rage throughout the country, a true status symbol. Even Queen Marie Antoinette wore potato blossoms in her hair, creating a new fashion image for the women of Paris.

The French still consider the potato a key vegetable in their great cuisine. The famed cooking school Ecole Rabilais requires students to prepare 60 potato dishes for graduation. There is even an Academie Parmentier - Grand Ordre du Noble Tubercule, an association of gourmets restaurateur and chefs who honor and promote the potato. Today the potato is part of almost every French meal.

It reputedly took seven transatlantic crossings before the potato gained acceptance in North America. In fact, the potato did not really become popular until discovered by Benjamin Franklin. While ambassador to France, he attended a banquet hosted by Parmentier at which the potato was served 20 different ways including what we have come to know as French fries. Franklin returned to America singing the praises of the potato as the ultimate vegetable. Americans followed the lead of trendsetting Franklin, and soon the potato was being cultivated in the colonies and in remote regions of the western frontier. American potatoes really became fashionable when President Thomas Jefferson served them at a White House dinner.

Americans are so fond of potatoes that they eat almost 120 pounds of potatoes per person each year. That's an average of a potato a day. American farmers grew more than 30 billion pounds of potatoes last year. Write out the number 30,000,000,000. One pound of potatoes equals about three medium spuds. Imagine how much room 30 billion pounds would occupy.

The average potato has 100 calories. It provides 35% of the U.S. RDA (U.S. recommended daily allowances of vitamin C, 20% of vitamin B, 15% of iodine, 10% of niacin, iron and copper, 8% of folacin, phosphorous, magnesium and thiamin, 4% of zinc and 2% of riboflavin. The potato is a high source of potassium, but has no fat and only 5 mg of sodium.

(cont.)

Resources:

Potato Certification Association of Nebraska
Gary Leever
415 Black Hills Ave.
Alliance, Nebraska 69301
Phone: (308)762-1674

Materials:

1. Potatoes, students bring from home.
2. "Planting Potatoes and other Plants", Nebraska Ag in Classroom, learning activity.
3. Worksheet A
4. Magazines
5. Large sheet of paper.

Procedure:

1. Have students bring a potato (with eyes) to class. Wash the potatoes well and cut them in half. Cut the half with the fewest eyes in pieces. Allow students to taste the raw potatoes. If you have a mixture of red and white potatoes, try to determine if there is a difference in color, texture or flavor between the two varieties.
2. Students can grow potato plants from the remaining halves of their potatoes. (Refer to "Planting Potatoes and other Plants", learning activity in this publication).
3. Send a potato chart (Worksheet A) home with the students to fill out for the coming week. Ask parents to help them, but stress that the family should not alter their menu or their regular diet.
4. Discuss the history and background about potatoes.
5. After the charts have been returned, create a list on the chalkboard of all the ways potatoes were prepared. Have students brainstorm for other forms we eat or use potatoes.
6. Students can find pictures of potatoes, potato dishes and other forms or uses of potatoes in magazines. Cut them out and place on a large piece of paper that is the shape of a potato, to create a collage. (Use as a bulletin board display).
7. Discuss the many nutrients and vitamins in potatoes that are good for you. You might want to prepare some simple potato dishes for students to try.

Additional Activities:

A. Hot Potato:

Have students sit in a circle. Put a record on to play and have students pass a potato around the circle. Every time you stop the music the student left holding the "hot potato" must give a fact about potatoes. If they can not give a fact, they receive a french fry (made from a yellow sponge) or some other token. The student with the most french fries or tokens at the end loses.

B. One Potato:

Children stand in a circle with their fist held out in front of them. One child is "it". "It" touches each fist in turn, including his own, during the rhyme. The fist touched when "MORE" is said, places his fist behind his back. This continues until one fist remains. That child is the winner.

"One Potato" rhyme:

One potato, two potato, three potato, four.
Five potato, six potato, seven potato, MORE!

C. Potato Bowling:

Use 10 "Pringle" potato chip cans (since potato chips are a product of potatoes) as bowling pins and a potato as the ball. Have questions wrote on small pieces of paper concerning potatoes, their history and nutrition. Put several questions in each can. Divide the students into teams. Teams will take turns. One student bowls and picks one can out of the one's he knocked down. He picks a question out of the can. His team has to answer the one question. If the answer is correct, the team gets one point for each can that was knocked down. If the answer is not correct the team receives no points. The team with the most points wins.

The Not So Simple Spud

Worksheet A

Potatoes!

Please mark on the chart
each day you eat potatoes and how
they were prepared.

Example:

Date	Meal	Prepared
Friday	Supper	Baked

Subject Area: Math

Objective: The student will:

1. be able to compute multiplication facts and addition facts.
2. be able to follow directions.

Suggested

Grade Level: K - 3

Background:

Refer to "Grains as Food" pamphlet, enclosed in "Library Books/Resource Materials" folder in this notebook.

Resources:

Nebraska Corn Board
P.O. Box 95107
Lincoln, Nebraska 68509
Phone: (402) 471-2787

Materials:

1. "Oh Shucks" Activity Sheet A.
2. Worksheet A, with multiplication and addition facts.

Procedure:

1. Multiply or add the dots on the ears of corn on the left side of the stalk with those on the right:
Example: $4 \times 2 = 8$
 $4 \times 5 = 20$
2. Write the math fact and answer on the answer sheet. You will have 40 facts and answers.
3. This activity could be used in a learning center.

Additional Activities:

A. "Oh Shucks" Game.

1. Reproduce activity sheets for each student, but change dots.
2. The teacher holds up a card with a numeral printed on it. The student will place a kernel of corn on the ear with the corresponding number of dots.
3. When all the ears are covered with a kernel of corn the student will say "Oh Shucks". The students will then clear their cards and the game will start over again.
4. This could also be a small group activity.

Additional Activities:

(cont.)

B. Cooking Experience - Cornbread

1 cup yellow cornmeal

1 cup enriched flour or
whole wheat flour

2 tablespoons sugar

1/2 teaspoon salt



4 teaspoons baking powder



1 large egg



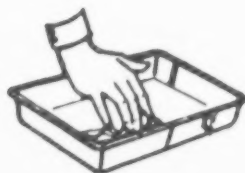
1/4 cup oil



1 cup milk

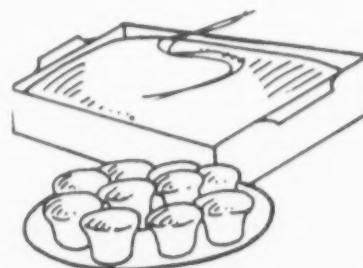


Mix all dry ingredients together in a bowl. Beat the egg, oil, and milk together in a bowl. Add the egg mixture to the dry ingredients; blend with a spoon only until all the flour is moistened. Do not overbeat because large air holes or tunnels will result.



Pour into a greased 8" square pan or 9" pie plate.

Bake at 425 degrees Fahrenheit for about 25 minutes or until golden brown. For muffins, pour batter into 12 greased muffin or corn stick pans two-thirds full. Bake at 425 degrees Fahrenheit for about 15 to 20 minutes or until golden brown.



Oh Shucks

Worksheet A

Name _____

Multiplication

A. $4 \times 2 = 8$

$4 \times \underline{\quad} = \underline{\quad}$

$4 \times \underline{\quad} = \underline{\quad}$

$4 \times \underline{\quad} = \underline{\quad}$

$4 \times \underline{\quad} = \underline{\quad}$

B. $6 \times \underline{\quad} = \underline{\quad}$

$6 \times \underline{\quad} = \underline{\quad}$

$6 \times \underline{\quad} = \underline{\quad}$

$6 \times \underline{\quad} = \underline{\quad}$

$\underline{\quad} \times \underline{\quad} = \underline{\quad}$

C. $2 \times 2 = \underline{\quad}$

$\underline{\quad} \times \underline{\quad} = 10$

$2 \times \underline{\quad} = \underline{\quad}$

$2 \times \underline{\quad} = \underline{\quad}$

$\underline{\quad} \times \underline{\quad} = \underline{\quad}$

D. $5 \times \underline{\quad} = \underline{\quad}$

$5 \times \underline{\quad} = \underline{\quad}$

$\underline{\quad} \times 3 = \underline{\quad}$

$\underline{\quad} \times \underline{\quad} = \underline{\quad}$

$\underline{\quad} \times \underline{\quad} = \underline{\quad}$

Addition

A. $4 + 2 = 6$

$4 + \underline{\quad} = 9$

$4 + \underline{\quad} = \underline{\quad}$

$4 + \underline{\quad} = \underline{\quad}$

$4 + \underline{\quad} = \underline{\quad}$

B. $6 + 2 = \underline{\quad}$

$6 + \underline{\quad} = \underline{\quad}$

$6 + \underline{\quad} = \underline{\quad}$

$\underline{\quad} + 4 = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

C. $2 + 2 = \underline{\quad}$

$2 + \underline{\quad} = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = 3$

D. $5 + 2 = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$5 + \underline{\quad} = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$\underline{\quad} + \underline{\quad} = 6$



A "CORN" game

Oh Shucks Activity Sheet A



Ag in the Classroom Our Farm Friends Program

Subject Area: Social Studies

Objective: The student will:

1. discover what kinds of farms exist in Nebraska.
2. learn some of the towns and areas of Nebraska and be able to locate them.
3. learn more about the farms they are familiar or associated with.

**Suggested
Grade Level:** K - 6

- Materials:**
1. A very large map of Nebraska, enclosed in "Library Books/Resource Materials" folder in this notebook.
 2. Worksheet A.
 3. Yarn, pins and agriculture symbols (patterns for agriculture symbols are on Activity Sheets A1, A2 and B).

- Procedure:**
1. Brainstorm and discuss the kinds of farms the class is familiar or associated with. Some possible starter questions are: What kinds of farms are your grandparents, parents, or friends involved with? What other kinds of farms are there? (i.e. dairy cattle, beef cattle, sheep, hog, grain, combination, etc.).
 2. Send the worksheet home for students and their families to fill out and return to the teacher.
 3. After the worksheets have been returned, have each student pick the ag symbol that would be appropriate for their friend's or family farm.
 4. Write the student's name, the farm's location (nearest town) and one fact about that farm on the symbol. The student can color or decorate the symbol if desired.
 5. Have the students share the information they've gathered with the class.
 6. Attach one end of a piece of yarn to the symbol and pin the other end to the appropriate location on the map. Attach the symbol to the bulletin board outside the Nebraska border (example on Activity Sheet B).

Our Farm Friends Worksheet A

Student's Name _____

Can you help us with our agriculture unit? We need to know if any friends or relatives of your family has a farm in Nebraska.
Please fill out the needed information for each farm.

Name of Farm Family _____

Farm Location (give the nearest town) _____

The Farm Itself:

How many acres is the farm? _____

Name any crops grown _____

Name any animals raised _____

How many people live on this farm? _____

How long has the family owned the farm? _____

Any other interesting facts? _____

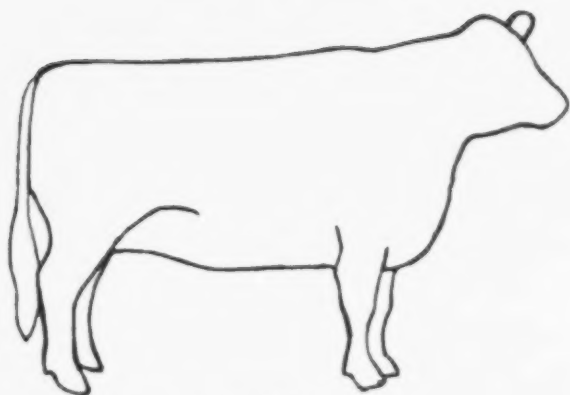
Thank you very much. This will help us to plot those farms on a large Nebraska map in our classroom.



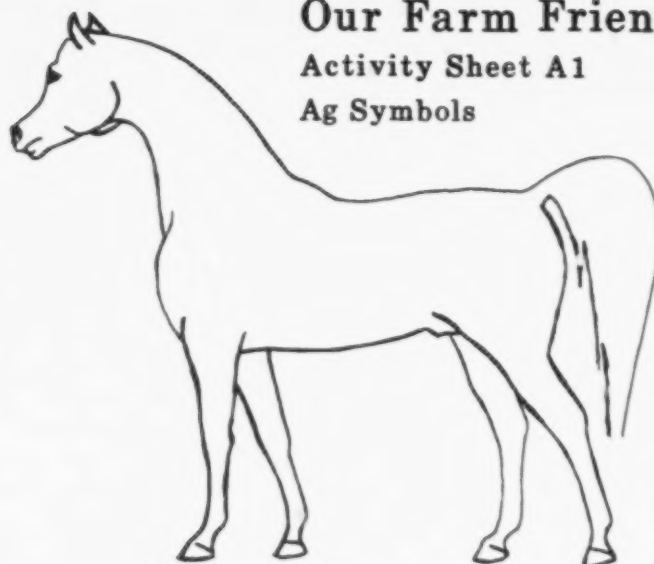
Our Farm Friends

Activity Sheet A1

Ag Symbols



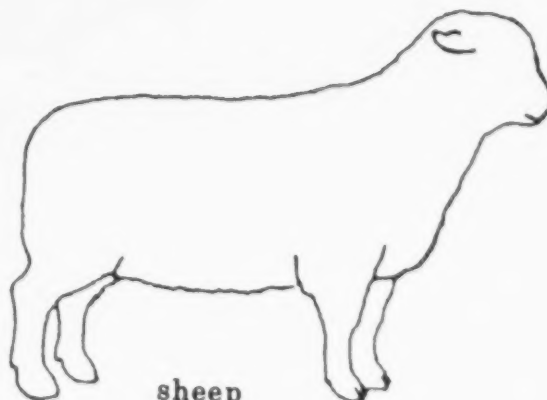
beef cattle



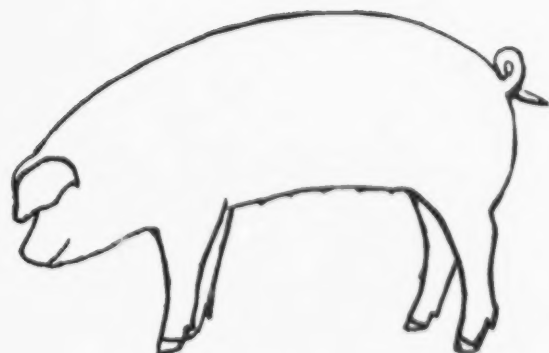
horse



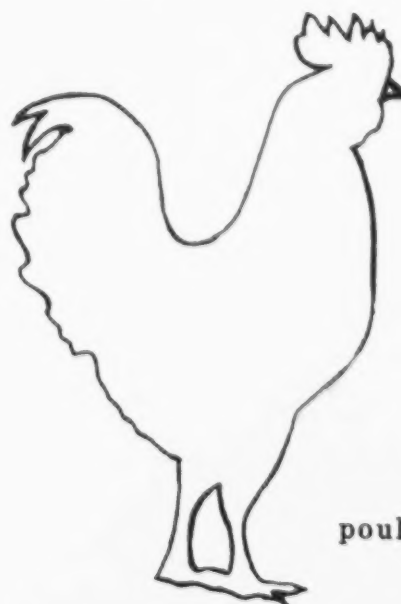
dairy cattle



sheep



hogs

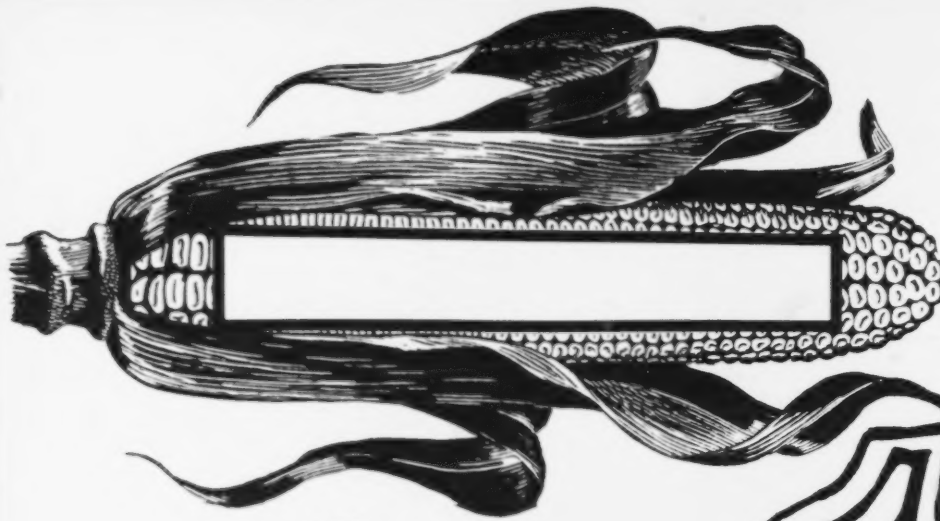


poultry

Our Farm Friends

Activity Sheet A2

Ag Symbols



corn



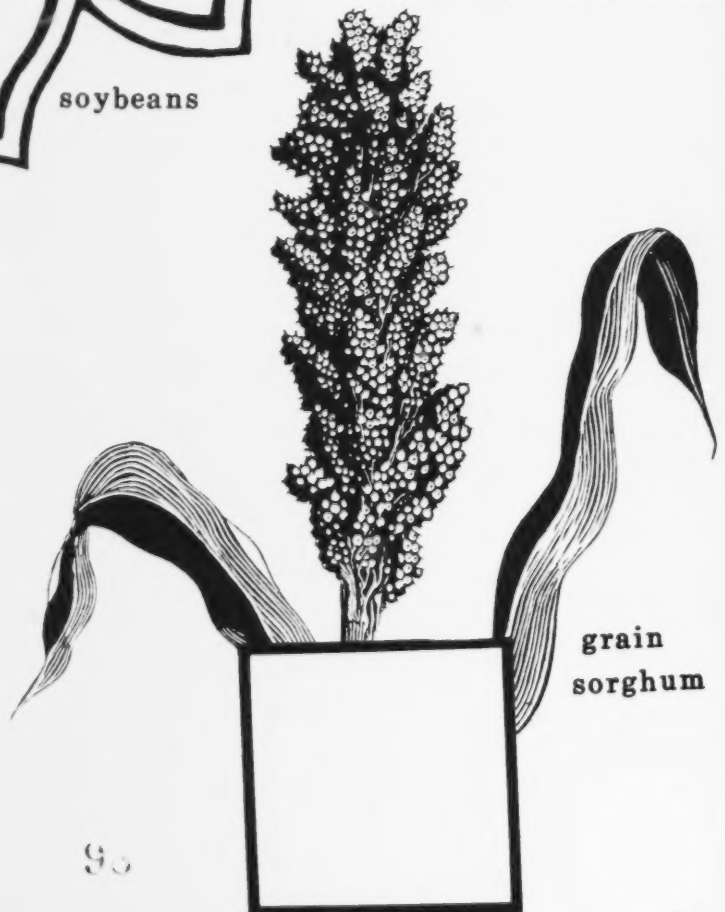
miscellaneous



soybeans



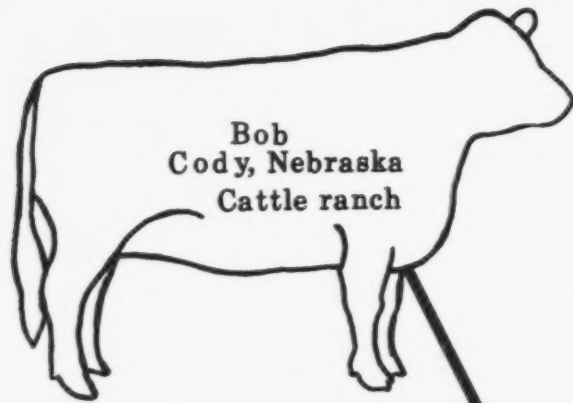
wheat



grain
sorghum

Our Farm Friends

Activity Sheet B



Subject Area: Math

Objective: The students will:

1. be able to work math problems to discover the by-products of hogs.
2. be able to identify by-products of hogs.

**Suggested
Grade Level:**

4 - 6

Background:

The following is information about hog by-products, where they come from and their uses.

1. Brains

are a potential source of cholesterol used as an emulsifier in cosmetics and as a tannin agent similar to the kind used by the American Indian.

2. Blood

is used as a leather finish, plywood adhesive and as a protein source in animal feeds. Blood albumin is used in fabric printing and dyeing.

3. Bones and skins

are used in the manufacture of glue and gelatin, the latter used as sizing in paper manufacture. Hog skins, called pigskin leather, are used to make colorful coats, jackets, gloves, shoes, handbags and sporting goods.

4. Dried bones

are also used for making novelties, buttons, bone china and glue.

5. Bone meal

is used in fertilizers and as a source of minerals (calcium and phosphate) in livestock, poultry and pet feeds. Bones are a good source of calcium phosphate, used in the manufacture of enamel, glass and cleaning agents. Bone meal is used as a filtering agent in water purification systems.

6. Fatty acids and glycerol

from inedible pork fat are used in insecticides, weed killers, lubricants and oil polishes. They are used in chalk, crayons, phonograph records, matches, putty, paper sizing, insulation, linoleum, printing inks, ball bearings and flatting agents for paint and varnish.

Background:
(cont.)**7. Pancrelipase**

made from hog pancreas glands, is used in tanning leather and as a digestive enzyme in certain septic tank cleaners and drainers.

8. Glycerine

is used in the manufacture of cosmetics, pharmaceuticals, antifreeze, nitroglycerine (explosives), plastics (glycerine and resins), plasticizers, printing rollers and also cellophane.

9. Gall Stones

collected and shipped to the Orient, are used as ornaments in necklaces and pendants.

10. Hair

especially longer heavier hog bristles, is used in paint brushes and natural bristly hair brushes. Hog hair is also used in insulation materials and padding in upholstery.

Resources:

Nebraska Pork Council Women
112 Mussehl Hall
Lincoln, Nebraska 68583

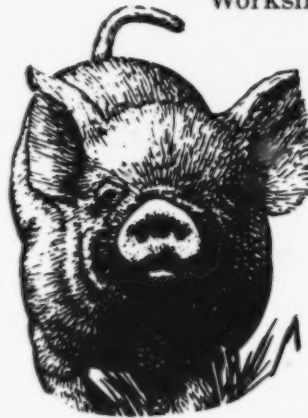
Phone: (402)472-2565

Materials:

1. Worksheet A
2. Answer Key A

Procedure:

1. Have students work each math problem and write the answer in the blank above the math problem. Use the answers to find the appropriate letter in the code and fill in the blank below the math problem. The finished word is a by-product of hogs.
2. Discuss how we use these by-products everyday.



Hog By-products

Secret Letter Code:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	E	I	O	U	W	Y	B	A	D	F	G	H	Q	J
16	17	18	19	20	21	22	23	24	25	26				
K	N	R	L	M	P	S	V	T	Z	X				

Directions:

Work the math problem, write your answer in the blank above the problem. Then use the letter code to find the appropriate letter that goes with your answer and fill in the blank below the math problem. When you're finished, you should have a list of hog by-products.

1. $\frac{\quad}{5+6}$ $\frac{\quad}{3 \times 3}$ $\frac{\quad}{16 \div 2}$ $\frac{\quad}{9 \times 2}$ $\frac{\quad}{3 \times 1}$ $\frac{\quad}{1 \times 1}$ $\frac{\quad}{20 \div 2}$ $\frac{\quad}{21 \div 3}$ $\frac{\quad}{4-2}$ $\frac{\quad}{11+11}$
2. $\frac{\quad}{4 \times 3}$ $\frac{\quad}{17+2}$ $\frac{\quad}{10 \div 2}$ $\frac{\quad}{8 \div 4}$
3. $\frac{\quad}{4 \times 2}$ $\frac{\quad}{16 \div 4}$ $\frac{\quad}{20-3}$ $\frac{\quad}{2 \times 1}$ $\frac{\quad}{3-2}$ $\frac{\quad}{8+5}$ $\frac{\quad}{9-6}$ $\frac{\quad}{14+3}$ $\frac{\quad}{27 \div 3}$
4. $\frac{\quad}{60 \div 5}$ $\frac{\quad}{21-2}$ $\frac{\quad}{81 \div 9}$ $\frac{\quad}{44-22}$ $\frac{\quad}{11 \times 2}$ $\frac{\quad}{\quad}$
5. $\frac{\quad}{1+0}$ $\frac{\quad}{9 \times 2}$ $\frac{\quad}{45 \div 5}$ $\frac{\quad}{4+3}$ $\frac{\quad}{6-2}$ $\frac{\quad}{27-10}$ $\frac{\quad}{44 \div 2}$
6. $\frac{\quad}{4 \times 2}$ $\frac{\quad}{9 \times 2}$ $\frac{\quad}{40 \div 8}$ $\frac{\quad}{11 \times 2}$ $\frac{\quad}{17-4}$ $\frac{\quad}{8-6}$ $\frac{\quad}{22 \times 1}$
7. $\frac{\quad}{7 \times 3}$ $\frac{\quad}{1+1}$ $\frac{\quad}{48 \div 2}$ $\frac{\quad}{22-11}$ $\frac{\quad}{32 \div 8}$ $\frac{\quad}{36 \div 9}$ $\frac{\quad}{5 \times 2}$
8. $\frac{\quad}{4 \times 2}$ $\frac{\quad}{25 \div 5}$ $\frac{\quad}{48 \div 2}$ $\frac{\quad}{12 \times 2}$ $\frac{\quad}{3+1}$ $\frac{\quad}{16+1}$ $\frac{\quad}{22 \times 1}$

Pig Joke: What position does a pig play in football?

$\frac{\quad}{17+2}$	$\frac{\quad}{3+1}$	$\frac{\quad}{2+1}$	$\frac{\quad}{14+3}$	$\frac{\quad}{10-2}$	$\frac{\quad}{3 \times 3}$	$\frac{\quad}{1 \times 1}$	$\frac{\quad}{8 \times 2}$	$\frac{\quad}{8 \div 4}$	$\frac{\quad}{9 \times 2}$
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1. FABRIC DYES
2. GLUE
3. BONE CHINA
4. GLASS
5. CRAYONS
6. BRUSHES
7. PET FOOD
8. BUTTONS

PIG JOKE:
LOIN BACKER

Subject Area: Science

Objective: The student will:

1. describe the procedure of planting that is unique to potatoes as compared to grain sorghum (milo).
2. discover how plants grow.

Suggested

Grade Level: K - 4

Background: Potatoes are planted by using a piece of potato that contains one or two eyes. Most other plants, such as grain sorghum, are planted with a seed.

Resources: Potato Certification Association of Nebraska
Gary Leever
415 Black Hills Ave.
Alliance, Nebraska 69301

Phone: (508) 762-1674

Materials:

1. Soil
2. Gravel
3. Potatoes
4. Grain Sorghum seeds (corn, soybeans, or wheat could also be used. These can be obtained from a feed store or grain elevator.)
5. Paper cups (or small milk cartons collected from lunch.)
6. Toothpicks
7. Masking Tape
8. Knife
9. Water

Procedure:

1. Discuss and compare the differences in planting potatoes with a piece of potato with an eye, whereas grain sorghum is grown by planting seeds.
2. Fill paper cups three-quarters full of water (one for each student).
3. Cut potatoes into good sized parts, each part should have 2-3 eyes. Each student should have a potato part. Suspend the potato part in water with toothpicks. Be sure water covers 3/4 of potato until roots begin to form (takes about 2 weeks).

Planting Potatoes and Other Plants

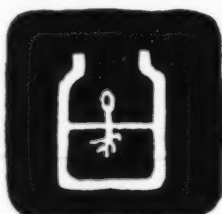
Procedure: (cont.)

5. After roots have formed, plant the potatoes and the grain sorghum seeds. To do this, give each student two paper cups. Put a small amount of gravel in the bottom for drainage, then fill three-quarters with soil. Have each student plant a potato (roots down) in one cup and grain sorghum seeds in the other.
6. Students should label the cups with their name, the kind of plant (potato or grain sorghum) and the date.
7. Water plants every other day, just enough to darken the soil. Within a few days you should see growth.
8. Discuss the activity with the students. Possible questions to ask include: What do the seeds need to grow? (soil, sun and water); What happens as the seed begins to grow?; What part of the plant grows first? (roots); How long before shoots or leaves appear? Did the grain sorghum seeds or the potatoes sprout first?

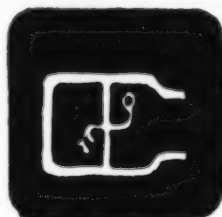
Additional Activities:

How do plants grow?

1. Glass jar with lid
2. Soil and seed



To discover more about how plants grow, a demonstration jar could be set up as follows:



1. Fill a glass jar with soil. Insert a potato with the eyes sprouted or a grain sorghum seed halfway down in the jar next to the glass. Add a little water and close the jar with a water tight lid. Begin with the jar upright. When the seeds send out roots, lay the jar on its side, and in a day or two, the roots will turn to grow down and the new top growths will grow up. Each time you turn the jar, the roots and stems will turn as well.



2. Discuss with the students why the plant's stems and roots change the direction they grow in (the affect lights has on how plants grow).



Subject Area: Science

Objective: The student will:

1. be able to categorize seeds into three groups (grains, fruits/vegetables and flowers).
2. be able to identify five different grains (crops) produced in Nebraska.

**Suggested
Grade Level:** K - 4

Background: Refer to Learning Activity "Soybean Math" for information on soybeans.
Refer to "Grains as Food" pamphlet, enclosed in "Library Books/Resource Materials" folder in this notebook for information on other grains.

Materials:

1. Students will bring seeds from home.
2. One jar of each grain: corn, wheat, grain sorghum, oats, and soybeans.
3. Chart on chalkboard and Worksheet A.
4. Worksheet B.
5. Answer Key.

Procedure:

1. Have students bring different kinds of seeds from home.
2. Identify and categorize the seeds according to color, size, edible, unedible, etc.
3. On the chalkboard, draw the chart as shown on Worksheet A and make copies of the chart for each student.
4. Divide the class into groups of five or six students. Each group will divide their seeds into these three categories: 1) grain 2) fruit/vegetables and 3) flowers. Ask the groups for their results and the teacher will list the seeds under the appropriate category on the chalkboard.
5. Introduce the five jars of seeds. Identify and describe the seeds in each jar. Talk about the uses of each grain and some products made from each.
6. Place the jars of seeds in the learning center. Each student will individually complete Worksheet B, at the learning center. Modify the worksheet according to the grade level.

Categorize the seeds
into these categories:

Worksheet A

Seeds, Seeds, Seeds

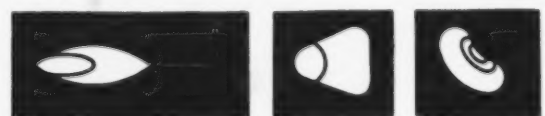
GRAINS	FRUITS/VEGETABLES	FLOWERS
	  	

A. Match the names with the jar numbers.

Jar 1	_____	corn
Jar 2	_____	grain sorghum
Jar 3	_____	soybeans
Jar 4	_____	oats
Jar 5	_____	wheat

B. Study the five seed jars carefully. Answer each question. Check your answers with the answer key card.

1. The largest seed is _____.
2. The larger seeds with the little black eyes are _____.
3. The tiniest seeds are _____.
4. The long and narrow seeds are _____.
5. The small, oblong seeds with the light brown color are _____.
6. Oatmeal and other cereals are made from the grain _____.
7. Grinding of the _____ grain will make flour for bread.
8. _____ are used to make cooking oils, shortening, mayonnaise and soy sauce.
9. A sweetner called fructose, corn meal, corn flakes, and corn starch are made from the _____ seed.
10. _____ is used mostly to feed livestock.



Answers to worksheet, Part B.

1. corn
2. soybeans
3. grain sorghum
4. oats
5. wheat
6. oats
7. wheat
8. soybeans
9. corn
10. grain sorghum

Subject Area: Art**Objective:** The student will:

1. be able to gain more of an understanding for sheep, by identifying unique characteristics about sheep.
2. be able to apply these characteristics to make a flock of sheep.

Suggested**Grade Level:** 4 - 6**Background:**

The following information includes certain characteristics about sheep. Sheep usually have twins or triplets when they lamb. Lambs are the only farm animals that can be raised for market on just their mother's milk and pasture grasses. Sheep have two toes. They groom only their faces by licking their foreleg and then rub their face with it. Sheep live in groups called flocks. They sleep like dogs or cats, never sleeping deeply. They just rest mostly at night. Sheep have long, thick soft hair called wool which can be made into material for clothing. Sheep are very sure footed, they can run up to 30 m.p.h. Sheep eat facing the same direction always keeping the wind blowing toward them. Each sheep usually keeps two other sheep in sight when feeding. They have no front teeth on the upper jaw. The lower jaw has a full set of teeth. Sheep eat by tearing the grass off close to the ground and jerking their heads forward and upward.

Resources:

Nebraska Sheep Council
 Ted Doane
 211 Marvel Baker Hall
 University of Nebraska
 Lincoln, Nebraska 68583
 Phone: (402) 472-3095

Materials:

1. Small pine cones
2. Spray paint (white)
3. Black felt
4. Flat toothpicks
5. Tiny beads
6. White glue
7. Scissors (regular and heavy scissors)
8. Craft or popsicle sticks
9. Worksheet A
10. Answer Key A and B
11. A few clothespins
12. Wax paper

Ag in the Classroom Sheep Are Ewe-nique

Program

Procedure:

1. Discuss some of the unique characteristics of sheep and compare these characteristics to students or other animals they are familiar with.
2. Have students fill out Worksheet A and check with Answer Key A.
3. Make a flock of sheep to display in your room, the class can make one large flock or each student can make their own flock.
4. Paint the pine cones white, set aside to dry.
5. For the head, cut a 1-inch square of felt. Fold in half and glue shut. You may want to clip a clothespin on the folded felt until the glue dries. Fold the felt in half again to make a small square. Glue and let dry. Trim felt as shown in diagram 1.

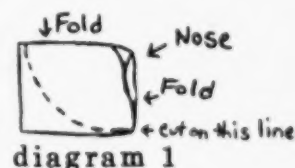


diagram 1

6. Glue felt head to fat end of pinecone.
7. Cut ears from felt according to diagram 2.



diagram 2

8. Glue felt ears to sheep's head. Glue beads for eyes to sheep's head.
9. For legs, glue wide ends of four toothpicks to the bottom of the pinecone (use lots of glue). Legs should slant outward. Let glue dry overnight. Trim legs with scissors so they are even and the sheep will stand. Paint legs black.
10. You can make a fence to hold your flock in by making L-shaped sections, that will stand up easier. Each L-shaped section is made up of three posts and six rails. You can make as many L-shaped sections as you want.
11. To make a fence post, cut six craft sticks or three popsicle sticks 2-1/4 inches long for each fence post. Glue craft or popsicle sticks together (use plenty of glue). You may want to clip with a clothespin until glue dries.

Procedure:**(cont.)**

12. For rails, use popsicle sticks or cut craft sticks 4-1/2 inches long. Put piece of waxed paper over fence pattern (see Answer Key B) and lay three popsicle or craft sticks on pattern. Craft sticks will be a little narrower than the popsicle sticks used to create pattern, so in using craft sticks, use the pattern as a guide to get sticks straight.

Glue posts to both ends of rails. Carefully remove fence section from pattern. Put stones or other weights on posts to hold them until glue dries.

13. For second part of L-shaped section, lay three sticks for rails on pattern, but glue a post only to one end. To the other end, glue one post from fence section already completed. Put weights on posts and let dry.
14. Set up your pen and put your flock inside.



Sheep Characteristics

Read each sentence about sheep.

Fill in the blanks using these words:

night	wool	no
foreward	run	faces
meat	flocks	
sleep	milk	
upward	wind	
sleeping	lambs	
direction	clothes	
grasses	wool	
lower	footed	
two	faces	
triplets	twins	

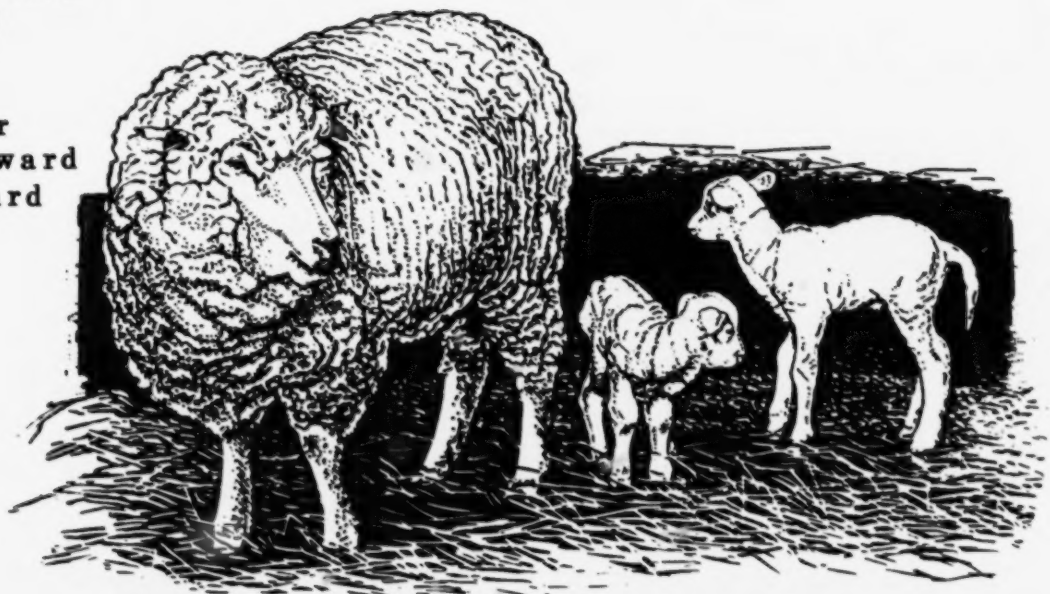


1. Sheep usually have _____ or _____ when they lamb.
2. _____ are the only farm animals that can be raised for market on just their mother's _____ and pasture _____.
3. Sheep have _____ toes.
4. Sheep groom only their _____. They lick their forelegs and then rub their _____ with it.
5. Sheep live in groups called _____.
6. Sheep _____ like dogs or cats, never _____ deeply. They rest mostly at _____.
7. Sheep have long, thick soft hair called _____ which can be made into material for _____.
8. Sheep produce _____ as well as _____.
9. Sheep can _____ 30 m.p.h. They are also very sure _____.
10. Sheep eat facing the same _____. They always keep the _____ toward them.
11. Sheep have _____ front teeth on the upper jaw. The _____ jaw has a full set of teeth. They jerk their heads _____ and _____.

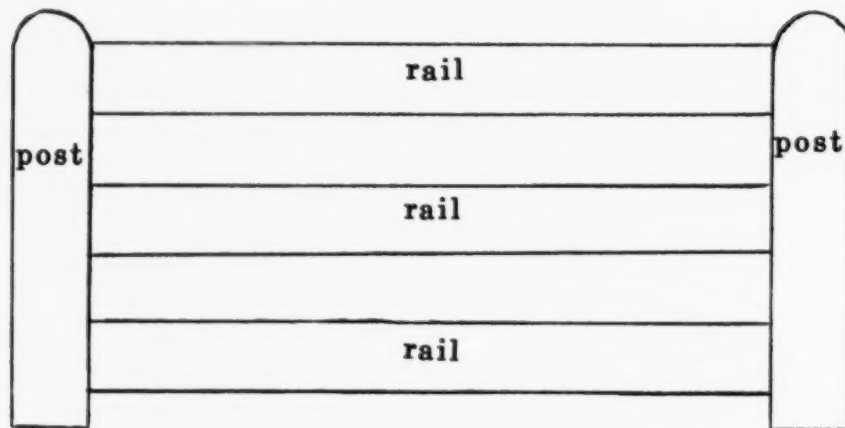
Sheep Are Ewe-nique

Answer Key A

1. twins
triplets
2. Lambs
milk
grasses
3. two
4. faces
faces
5. flocks
6. sleep
sleeping
night
7. wool
clothes
8. wool
meat
9. run
footed
10. direction
wind
11. no
lower
foreward
upward



Sheep Are Ewe-nique
Answer Key B
Fence pattern



Subject Area: Language Arts

Objective: The student will:

1. be introduced to the products made from milk.
2. learn to spell dairy products.

**Suggested
Grade Level:** K - 2

Background: For information on milk see pamphlets "Milk" and "From Moo to You" enclosed in "Library Books/Resource Materials" folder in this notebook.

Resources: Other pamphlets are available describing dairy products from the Dairy Council of Central States, offices located at:

Suite 103 Hillcrest Building
Ralston, Nebraska 68137
Phone: (402) 592-3355

4740 A Street
Lincoln, Nebraska 68510
Phone: (402) 488-0153

620 Badgerow Building
4th and Jackson Streets
Sioux City, Iowa 51101
Phone: (712) 252-2932

Materials:

1. Milk Pail Vocabulary Cards (Activity Sheets)
2. Answer Key

Procedure:

1. Discuss that milk comes from a dairy cow. Discuss the nutrients in milk and how it builds better bones, teeth, and tissues. Brainstorm to create a list of dairy products.
2. Each milk pail card has a dairy product word on it. Cut pails out, then cut along dotted line to make two pieces. The student must match the two pieces together to spell the word correctly.



MILK FROM COW TO YOU

MILK COMES FROM HEALTHY, WELL-FED COWS



The main breeds of dairy cows are Holstein, Guernsey, Jersey, Brown Swiss, and Ayrshire.

A cow eats about 90 pounds of food each day. And she drinks 25-50 gallons of water a day. It takes her about 6½ hours to do this.

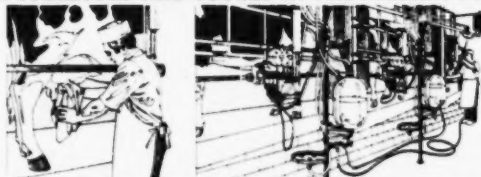
The milk cow changes the grass and grain she eats into something delicious for you to eat—milk.

There are about 11 million milk cows in America. They will make about 57½ billion quarts of milk this year.

It used to take a person one hour to milk 6 cows by hand. Today a person can milk 100 cows in an hour with modern machines.

A good cow can give about 100 glasses (25 quarts) of milk a day.

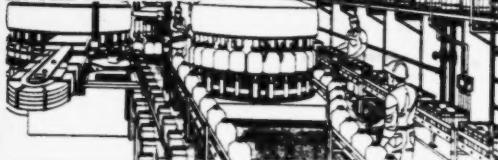
MILK IS COLLECTED AND COOLED IN THE MILKING PARLOR



Cows are milked at least twice each day.

Each time cows are milked, the dairy farmers wash the cows and the milking machines. They do this to keep the milk clean.

MILK IS PROCESSED FOR YOUR HEALTH IN THE DAIRY PLANT



Milk is one of the safest foods you can eat.

Milk is taken from the farm to the dairy plant in a tank truck. The tank is built like a giant Thermos® bottle to keep the milk cold.

Machines at the dairy plant keep your milk clean and safe. No hands touch milk from the cow to your carton.

In 1856, Dr. Louis Pasteur discovered that heat killed bad germs. Today your milk is "pasteur"-ized—heated. That makes it super safe to drink.

At the dairy plant, milk is checked again and again. That's why it is one of the safest foods you can eat.

Before modern milk delivery, when people traveled and wanted milk, they had to take their cows with them.

The Pilgrims brought cows with them to America. That great explorer, Admiral Byrd, took cows with him when he went to the South Pole.

Sometimes people couldn't take their cows with them. So, they made the cow's milk into foods like cheese and yogurt, and took these along instead.

Today, you don't have to travel with a cow. Thanks to a modern, fast, delivery system you can find milk and other dairy foods wherever you go.

MILK IS DELIVERED TO MANY PLACES



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When was milk "discovered"? The historians cannot tell us for sure—just as there is no exact record as to when other dairy foods became part of the human diet. The world's earliest written records—found in the Sanskrit of ancient India—date back nearly 6,000 years, but milk had already become an important food. To the early people of central Asia the cow was so important that wealth was measured in numbers of cattle. Later the cow was worshipped in India, in Babylonia, and in Egypt. There are more than 50 references to cows and milk in the Old Testament.

From ancient times until this day, changes in milk production occurred due to the lack of refrigeration and transportation until milk was consumed within a few hours of when it was produced. But with the rapid growth of other dairy dairy changes, refrigeration, pasteurization, modern milking equipment, mechanical refrigeration, pasteurizing and bottling plants, the cream separator, and special milk trucks and tank trucks. With these innovations, there was a shift of the processing and the delivery of milk from farms to processing plants.

With increased markets, the scientific study of cattle breeding and feeding became essential for greater milk production.

Milk Production

Through the application of scientific breeding, the average milk production per

dairy cow rose 89 percent during the last two decades. In 1960 the average was 11,699 pounds (514.9 quarts) of milk per cow compared to 7,629 pounds (317.1 quarts) in 1940. The world's champion Holstein cow averaged 60 quarts per day or 44,000 pounds (2000.0 quarts) of milk in one year.

One of the wonders of the cow—nature's own food factory—is that the composition of her milk is about the same day after day. It is the quantity not the quality of milk that varies with her feed.

When eating only grasses in a pasture or hay in the winter, a good cow makes about 12 quarts of milk daily. But when that cow is fed silage and concentrates, she can produce 20 quarts of milk a day or more. Silage is chopped green corn, sorghum, and soybeans. Concentrates are mixtures of grains and seed oil cake, with protein, minerals, and vitamins added. The purpose is to feed a cow a complete ration of all the nutrients and energy.

Much of what the cow eats is converted directly to milk. She has the ability to convert coarse feed into delicious, nutritious milk. Her complex digestive system allows her to use almost all the feed

Without being chewed, a cow's feed is regurgitated and chewed in the first compartment of her stomach, the rumen. There, microorganisms break it down and make B vitamins and protein. In the next compartment, the reticulum, the food is squeezed into waste curdled clots. They are spit back into the mouth and are chewed to break up the fibers. When the chewed food enters the third compartment, the omasum, most of the food is converted into fatty acids. These are absorbed into the blood and used for energy and to make milkfat.

The remaining fine material and fluid enter the third compartment, the omasum. In it the excess water is squeezed out. In the fourth compartment, the abomasum, chemical digestion begins with gastric juices and acid. Digestion continues in the intestine, where the nutrients, such as protein and minerals, are absorbed into the bloodstream.

Milk

Milk Ageless Food With Natural Appeal



The cow's udder is divided into four quarters. In each, tiny cells in grape-like clusters called alveoli combine the nutrients from the digested food into milk. When the cow is being milked, the alveoli contract and the milk flows through into the teats.

A milking machine unit has four teat-shaped rubber cups, which are attached to the teats. The milk is removed by suction provided by a pulsating vacuum. Milking takes three to five minutes. The cows are milked at least twice a day.

When withdrawn, the milk is at the cow's body temperature of about 100°F (38°C). It flows into a refrigerated tank where it is rapidly cooled to at least 45°F (7°C). The cold temperature maintains the high quality of the milk while it is held for pickup.

The tank truck driver who makes the pickup inspects the milk to see if it is cold and has a clean aroma. He takes out a sample which will be tested at the processing plant. Then the cold milk is pumped from the refrigerated farm tank through a sanitized hose into the insulated tank on the truck.

After the milk sample passes several tests at the processing plant, it is pumped through sanitized pipes into the processing plant's refrigerated holding tanks.

Milk Processing

Modern dairy processing plants are technical wonders of automation. Milk is never touched by human hands. After each processing step, the milk is tested again to be sure the equipment has worked properly and that the milk has not been contaminated. The U.S. Food and Drug Administration describes milk as "One of the best controlled, inspected and monitored of all food commodities."

The main processing steps that ensure the good taste, high quality, and safety of farm-fresh milk are explained below.

After vitamin D is added (and vitamin A in lowfat and skim milk), the milk is pasteurized. Heating milk (pasteurization) assures its safety and increases its keeping quality. Milk is most commonly pasteurized at 161°F (71.5°C) for 15 seconds. Ultra-pasteurized milk and ultra high temperature (UHT) processed milk are heated to 280°F (138°C) for at least two seconds, which increases the refrigerated shelf life.

As if lower red oil the pasteurized milk is homogenized by being pumped through extremely fine openings. The milkfat is broken up into particles too small to stick together. As a result, they remain mixed throughout the milk rather than rising to the top as a layer of cream.

The pasteurized ultra-pasteurized, or UHT processed milk is cooled rapidly to at least 45°F (7°C). The UHT milk is packaged into pre-sterilized containers and aseptically sealed. Since bacteria cannot enter the UHT milk, it can be kept unrefrigerated for at least three months. The pasteurized and the ultra-pasteurized milks are packaged and stored in a refrigerated space until loaded onto an insulated delivery truck.

What Is Really in Milk?

Milk is about 87 percent water and 13 percent solids. The solids consist of fat and the fat-soluble vitamins it contains and the solids not fat, which include protein, carbohydrate, water-soluble vitamins, and minerals. The minimum amounts of fat and the solids not fat in milk that is shipped in interstate commerce are specified by federal standards.

The bar graph shows the major nutrients in the fat and the solids not fat as percentages of the U.S. Recommended Daily Allowances (U.S. RDA). The U.S. RDA are the amounts of nutrients that are recommended for healthy adults and children over four years of age.

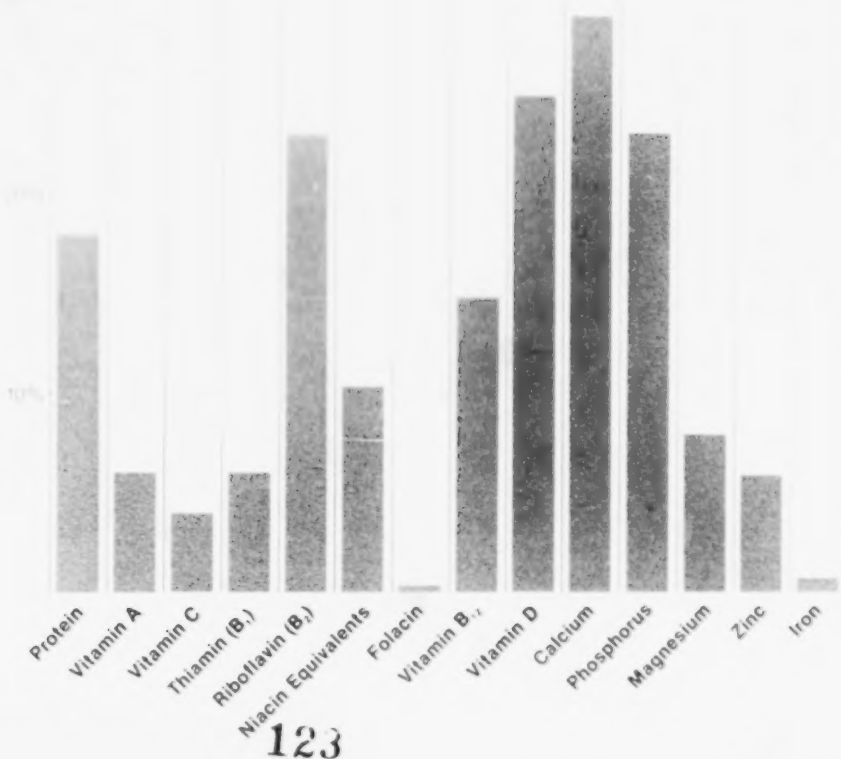
Milk

Percent Daily Allowance
(Percent Daily Requirement)

40%

20%

10%



Protein builds and maintains body tissues and helps form enzymes, hormones, body fluids, and antibodies which fight infection. Like carbohydrate and fat, protein can be used for energy.

Proteins are composed of amino acids. Of the 22 amino acids that make up food protein, eight are called essential for adults, nine for infants. Because these nine can't be made by the body, it is essential that people obtain them in their food. The other amino acids are non-essential because the body can make them as needed.

Casein makes up 82 percent of the protein in milk. It contains all the essential amino acids. So casein is used as the standard by which the protein quality of other foods is measured.

Carbohydrates provide energy. The carbohydrate lactose is found almost exclusively in milk since it is the sugar secreted by the mammary glands.

Lactose has unique characteristics which table sugar (sucrose) does not. For instance, lactose aids the absorption of the minerals calcium, phosphorus, magnesium, and zinc. Some studies indicate that lactose enhances the growth of beneficial microorganisms in the intestinal tract, some of which are believed to synthesize certain B vitamins.

Fats supply energy and carry the fat-soluble vitamins A, D, E, and K. Since milkfat is a natural fat, it contains a blend of fatty acids. Milk's fatty acids are 66 percent saturated, 30 percent mono-unsaturated, and 4 percent poly-unsaturated. One of the fatty acids in milk, linoleic, is essential.

Vitamins regulate body processes.

Fat-soluble vitamins A and D are in milkfat. Carotenoids, which give milk its creamy color, are converted to vitamin A in the body. Vitamin A aids growth, helps maintain the health of tissues that protect against infection, and forms substances needed for sight in dim light. Vitamin D is necessary for the body to use minerals to make strong bones and teeth and to maintain bones.

Milk is an excellent source of the water-soluble riboflavin (vitamin B₂), which regulates the body's production of energy from dietary fat, carbohydrate, and protein. It also promotes healthy skin and eyes.

Minerals build and maintain body cells and regulate body processes. Milk is best known for the mineral calcium. In fact, 72 percent of the calcium available in the U.S. food supply was provided by milk and milk products in 1980.

Calcium is necessary for strong teeth and bones. When the daily diet is calcium-deficient, calcium will be removed from the bones. It is then used for contracting and relaxing muscles, normal nerve transmission, and the clotting of blood.

Recent research indicates that calcium helps to prevent and to lower high blood pressure in animals. Studies also show that healthy people consume more calcium than do people with high blood pressure.

Since it is difficult to obtain sufficient calcium without milk and other milk products in the diet, the following recommendations for milk consumption have been established:

Children	3 cups (smaller glasses for children under 8)
Teenagers	4 cups
Adults	2 cups
Pregnant and Lactating Women	4 cups

Another important mineral in milk is phosphorus, which is deposited in the bones with the calcium. The ratio of calcium to phosphorus in milk is about the same as that in bones. This promotes bone formation (calcification).

REAL: Imitation, and Substitute Milks

Cow's milk, which is produced in the United States and meets all federal and/or state standards for quality, is increasingly identified by a  symbol on the carton or package. The dairy industry developed the REAL[®] Seal program to help consumers easily identify real dairy foods from "look-alikes."

REAL[®] milk is a Grade A, ready-to-eat convenience food. All that consumers need to do is open and pour to get 58 measurable nutrients plus good taste. And, there are many milks from which to choose.

REAL[®] milk is 96.75 to 99.83 percent fat-free. Some people say they choose an imitation or substitute product because they want to cut down on their saturated fat intake. But, in an imitation or a substitute milk, milkfat may be replaced with vegetable oil. Vegetable oils vary in their saturated fat content. For example, when stearic acid oil (from palm or coconut oil) replaces the milkfat, there will be 45 percent more saturated fat and 79 percent less linoleic acid (an essential fatty acid) than in milk.

An imitation product may look and taste like a traditional product, such as milk, but it is nutritionally inferior. Therefore, according to federal regulations, the product must have the word "imitation" in its name.

In September 1978, the U.S. Food and Drug Administration (FDA) proposed standards of identity for milk substitutes. They included "nutritional equivalency" (equal in nutrients). But, as yet, those proposed standards have not been finalized.

Milk Facts and Fallacies

Fallacy: Raw milk is better than pasteurized milk.

Fact: Quick high-temperature pasteurization minimizes nutrient losses. From the standpoint of health, the chance of getting a disease from raw milk far outweighs the minute nutritional advantage of raw milk. Because of this, the American Academy of Pediatrics endorses only pasteurized milk for infants and young children.

Fallacy: Milk contains harmful additives.

Fact: Vitamin D is added to milk because almost three-fourths of the calcium available in our nation's food supply is from milk and milk products. With the aid of vitamin D, calcium builds and maintains strong bones. Since vitamin D has been added to milk, rickets has almost disappeared in the United States. (Rickets is caused by a vitamin D deficiency.)

Vitamin A is added to skim and lowfat milks. It replaces the vitamin A that is removed when milkfat is taken out to make lower fat milks.

Fallacy: Adults outgrow their need for milk.

Fact: Although calcium is almost synonymous with healthy teeth and bones, the

body's need for this mineral is not confined to the growing years. The maintenance of bones, where 99 percent of the body's calcium is found, is a life-long process. Research shows that when the daily diet is deficient in calcium, it will be removed from the bones and used for its other vital functions.

Research supports the view that a long-term calcium deficiency contributes to osteoporosis in adults. In this condition, bones become thin and porous, so that they break easily, especially in the elderly.

Fallacy: Non-whites can't drink milk

Fact: Some adults, most of whom are non-Caucasians, lose their ability to digest lactose which is the natural sugar in milk. Their digestive systems produce less lactase, an enzyme which digests lactose. These people are lactose intolerant. The undigested lactose may cause a bloated feeling, gas pains, and diarrhea. However, many lactose intolerant people can drink a single glass of milk with their meals without discomfort. In addition, a lactase-treated milk is available.

Fallacy: Milk is loaded with fat and calories

Fact: The following chart shows that, depending upon the type chosen, milk varies from 99.83 percent fat-free to 96.75 percent fat-free.

Milk	Fat %	Calories per cup
Buttermilk	0.38	99
Chocolate, 2% lowfat	2.00	179
Milk, Whole	4.25	140
2% lowfat	2.00	121
1% lowfat	1.00	102
Skim	0.25	86
Lactose-free, whole	4.25	140
2% lowfat	2.00	121
Nonfat dry, instant, reconstituted	0.12	82

Source: USDA, National Center for Human Nutrition Research, "Nutrient Data Laboratory," 4th ed., 1984, pp. 10-11.

How Many Types of REAL[®] Milks Are There?

The FDA has established definitions and standards of identity for the various milks shipped in interstate commerce. For uniformity, state and local agencies are encouraged to adopt the federal standards for milk produced and consumed within their borders. However, local standards of identity provide milkfat minimums from 3.0 percent to 3.8 percent and solids not fat minimums from 8.0 to 8.7 percent.

Fresh Fluid Milks

Depending upon its milkfat content, a fresh fluid product is named and labeled milk, lowfat milk, or skim or non-fat milk. Even though only vitamin D milk is printed on the carton or jug, it is commonly called whole milk.

Milk (whole), shipped in interstate commerce, must be pasteurized, ultra-pasteurized, or UHT processed, and it must contain at least 3.25 percent milkfat and 8.25 solids not fat. To meet these standards, milkfat and solids not fat may be removed or added during milk processing.

Under federal standards, homogenization and fortification with vitamins are optional. But if vitamin D is added, there must be 400 IU per quart.



Other optional ingredients include a carrier for the vitamin D and characterizing flavorings such as fruit and fruit juices or natural and artificial flavorings.

A 1-cup glass (8 fluid ounces, 244 grams) of whole milk contains about 150 Calories. Higher caloric levels indicate that more than the minimum milkfat and/or solids not fat is in the milk.

Lowfat milk has some milkfat removed. The product's name will declare the percentage of milkfat—0.5%, 1%, 1.5%, or 2.0%. All lowfat milks must contain at least 8.25 percent solids not fat. They must be pasteurized, ultra-pasteurized, or UHT processed, and contain 2,000 IU of vitamin A per quart.

Homogenization and fortification with vitamin D are optional. However, if added, the vitamin D must be at a level of 400 IU per quart. Other optional ingredients include those permissible for whole milk. Emulsifiers and stabilizers enhance the body of lowfat milk and keep the added milk ingredients dissolved.

If nonfat milk solids are added to reach the 10 percent solids not fat level, the product must be labeled *protein fortified* or *fortified with protein*. The calories per cup are increased with protein fortification.

Skim or nonfat milk has as much fat removed as possible. It must contain less than 0.5 percent milkfat and at least 8.25 percent solids not fat. It must be pasteurized, ultra-pasteurized, or UHT processed and fortified with 2,000 IU of vitamin A per quart.

Homogenization and fortification with vitamin D are optional. But, when added, the vitamin D content must equal 400 IU per quart. Other optional ingredients are the same as those permissible for lowfat milk.

Flavored milk is made by adding characterizing flavors, with or without coloring and nutritive sweeteners, to a specific standardized milk. The caloric and carbohydrate values will vary according to the milkfat content and the amount and composition of the added ingredients.

For example:

Schedule Milk	Calories	Water (grams)	Solids not fat (grams)	Fat (grams)
Whole	208	79	24.9	8.1
2% lowfat	179	80	26.0	5.0
1% lowfat	158	81	26.1	3.5

The protein, mineral, and vitamin content of flavored milks will be almost the same as that of the milk—whole, lowfat, skim—to which the flavoring is added.

Flavored milks must be pasteurized, ultra-pasteurized, or UHT processed. Homogenization and fortification with vitamin D are optional. Optional ingredients and vitamin A fortification are the same as for lowfat milk.

Evaporated and Condensed Milks

Evaporated milk and evaporated skimmed milk are made by heating milk to stabilize the protein. About 60 percent of the water is removed. Vitamin D is added to provide 25 IU per fluid ounce or 400 IU per reconstituted quart. Then they are sealed in cans and heat-treated to sterilize.

Evaporated milk must have not less than 7.5 percent milkfat and 25 percent total solids. It must be homogenized. Four fluid ounces (½ cup), or 1 cup when reconstituted, will contain about 170 Calories.

Evaporated skimmed milk must contain no more than 0.5 percent milkfat, unless otherwise specified, and not less than 20 percent total solids. Homogenization is optional. Vitamin A must be added so that each fluid ounce contains 125 IU. Four fluid ounces (½ cup), or 1 cup when reconstituted, will supply about 100 Calories.

Sweetened condensed milk and skimmed milk have about 60 percent of the water removed. They are mixed with a nutritive sweetener, usually sugar. The sugar will make up 40 to 45 percent of the condensed milk or skimmed milk. Both products must be pasteurized. Homogenization is optional.

The standard requires that sweetened condensed milk contain not less than 8 percent milkfat and 28 percent total milk solids. The skimmed milk product must contain not more than 0.5 percent milkfat, unless otherwise specified, and not less than 24 percent total milk solids.

Sweetened condensed milk never should be substituted for evaporated milk in an infant's formula—it will cause diarrhea. Since evaporated milk doesn't have sugar added like sweetened condensed milk has, the two can't be used interchangeably in recipes.

Acidified and Cultured Milk

When the word "acidified" is part of a product name, it means that an acid was added to the milk to produce its tart flavor. On the other hand, when "cultured" is in the name, a special bacterial culture was added. The bacteria convert part of the lactose—milk sugar—to lactic acid, which produces a sour flavor.

Cultured buttermilk can be made from lowfat, whole, or concentrated milks or reconstituted nonfat dry milk. It is made, most often, by adding a bacterial culture to fresh pasteurized or ultra-pasteurized skim milk with nonfat dry milk solids added. The milkfat and solids not fat are the same as the milk which is cultured until the acidity is not less than 0.5 percent. The name "cultured skim milk buttermilk" also includes "vitamins A and D added" if suitable.

Acidophilus cultured milk is pasteurized or ultra-pasteurized skim or lowfat milk with a bacterial culture (*Lactobacillus acidophilus*) added. It is well mixed, packaged, and cooled. Cooling it immediately prevents fermentation so that the natural flavor and consistency of milk are unchanged.

Once the milk is consumed, the bacteria become active at body temperature. They are thought to maintain the balance of beneficial microorganisms in the intestines. Acidophilus cultured milk may be prescribed for people who are taking antibiotics.

Dry Milks

Nonfat dry milk is produced by removing the water from pasteurized skim milk. It contains not more than 5 percent moisture and not more than 1.5 percent milkfat by weight, unless otherwise indicated.

After water removal, the concentrated milk is sprayed into hot air (spray drying) or a jet of hot air is sprayed into the concentrated milk (foam spray drying). Nonfat dry milk is a fine-textured product of very low moisture that reconstitutes easily in warm water with stirring. Instant nonfat dry milk dissolves immediately in cold water. It is made by moistening dry milk with steam so that larger and more porous particles form.

The nutritional content of reconstituted nonfat dry milk will be similar to the skim

milk from which it was made. A 1-cup (8 ounces, 244 grams) glass provides 82 Calories.

Nonfat dry milk fortified with vitamins A and D contains 2,000 IU of vitamin A and 400 IU of vitamin D per quart when reconstituted according to label directions. Almost all nonfat dry milk is so fortified.

Specialty Milks

Multivitamin and multiminerals are those to which multivitamin and multi-mineral concentrates are added. A state or local board of health may advise on their availability. Research is now focusing on improving the taste of milk fortified with iron.

Lactase-treated milk is pasteurized ultra-pasteurized, or UHT processed milk which has the enzyme lactase added.

Fresh, fluid, lactase-treated milk is available in some locations. Where it is not, consumers may purchase lactase enzyme products to add to their milk. Since the lactase-treated milk tastes sweeter than untreated milk, it is usually well liked. By drinking lactase-treated milk, even those who may be lactose-intolerant can receive the benefits of milk's nutrients.

Low sodium milk has most of the natural sodium removed and replaced with potassium before it is pasteurized and homogenized. Fresh low sodium milk is not widely available; all patients whose physicians prescribe it should check with their state or local health departments or local dairies for a source. When fresh low sodium milk is not available locally, canned low sodium milk can be used.

Certified milk is raw or pasteurized, fresh, fluid milk produced according to the *Methods and Standards for the Production of Certified Milk* issued by the American Association of Medical Milk Commissions. It may be homogenized and fortified with vitamin D.

Some individual states authorize the sale of raw certified milk within their state, but public health authorities do not advocate it. Since it is not pasteurized, raw certified milk may contain disease-producing microorganisms.

Shopping pointers

It is easy to pick out the kind of milk you want. The main panels of the container include:

- The product name
- The word "Pasteurized," if so processed
- The word "Homogenized," if so processed
- Ingredients, if any are added, such as vitamins or nonfat milk solids
- Full date (open dating) which indicates when the product should be withdrawn from retail sale. This date allows for additional storage life in the consumer's refrigerator.

The following chart shows how long milk's freshness will last when it is stored and transported at the recommended temperature.

Product	Approximate Storage Life	
	at 36°-40° F Temperature	Recommended Temperature
Fresh, fluid milk	5-7 days	4°-6° C (40°-45° F)
Rehomogenized	1-2 months	4°-6° C (40°-45° F)
Fluid, pasteurized	2-4 months	4°-6° C (40°-45° F)
Ultra-pasteurized	3-6 months	4°-6° C (40°-45° F)
Nonfat dry milk	6 months	4°-6° C (40°-45° F)
Whole dry milk	6 months	4°-6° C (40°-45° F)
Condensed milk	1-2 months	4°-6° C (40°-45° F)
Unopened	1-2 months	4°-6° C (40°-45° F)

Federal, state, and local agencies are involved in regulating the production and processing of milk. Consumers can rely on many safeguards to protect the milk they buy. But after purchasing it, consumers have the responsibility to protect the high quality and flavor of their milk.

Storage Tips

Keep milk fresh and good tasting by following these recommendations:

- When shopping, pick up the milk *just* before checking out.
- Refrigerate fresh milk as soon as possible after purchase or delivery to the home.
- Use milk in the order of purchase.
- Chill UHT milk before serving. After it is opened, keep it refrigerated.

- Once opened, fluid, dry milk should be refrigerated.
- After pouring the milk you need, return the remainder to the refrigerator.
- If you don't use all the poured milk, refrigerate the unused milk separately. Don't pour it back in the original container.
- Close containers to prevent the milk from absorbing flavors from other foods in the refrigerator.
- Store canned milk in a cool, dry place. After opening, pour the unused milk into a clean container and refrigerate.
- Store dry milk in a cool, dry place. Reseal the container after opening. Humidity causes dry milk to clump and may change the color and the flavor. If this occurs, the milk should not be used.
- Flavored milk changes its consistency, but not its nutritional value. If milk, flavored, thick, is in the refrigerator and slightly

Use Milk Often

For convenience, milk can be heat. Just pour it—no cooking, setting, or shaking is needed—and drink it with meals and as a snack.

Milk is not just a refreshing, nutritious drink; it is a basic ingredient in countless recipes—appetizers, beverages, main dishes, desserts, and snacks.

In cooking and baking, follow recipe directions. Milk should be heated just until bubbles form around the sides of the pan and steam escapes. Boiling milk will coagulate some of its protein which will form a film on the surface.

Cream sauces and soups, cereals, cooked or raw, milk on cereal, fluffy beverages, puddings, soufflés, pies, casseroles made with milk, milkshakes and dairy punches are just a few of the dishes that begin with milk.

Enjoy milk—the agreeable food with natural appeal for your nutritional health.

Vocabulary:

milk

cheese

buttermilk

chocolate milk

whipping cream

cream

cottage cheese

sour cream

butter

ice cream

yogurt

Spelling Milk Pails
Activity Sheet



Spelling Milk Pails
Activity Sheet

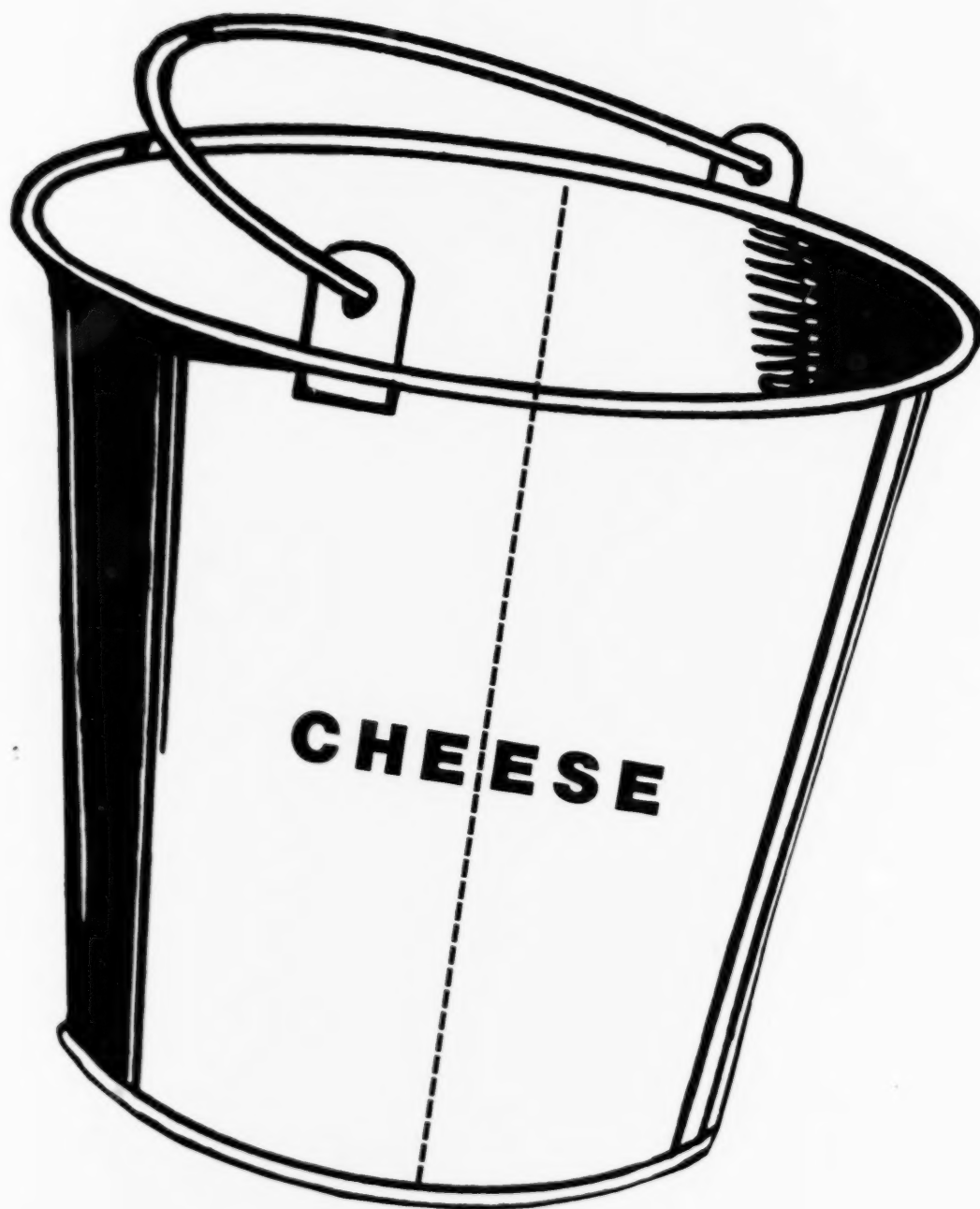


Spelling Milk Pails
Activity Sheet



Spelling Milk Pails

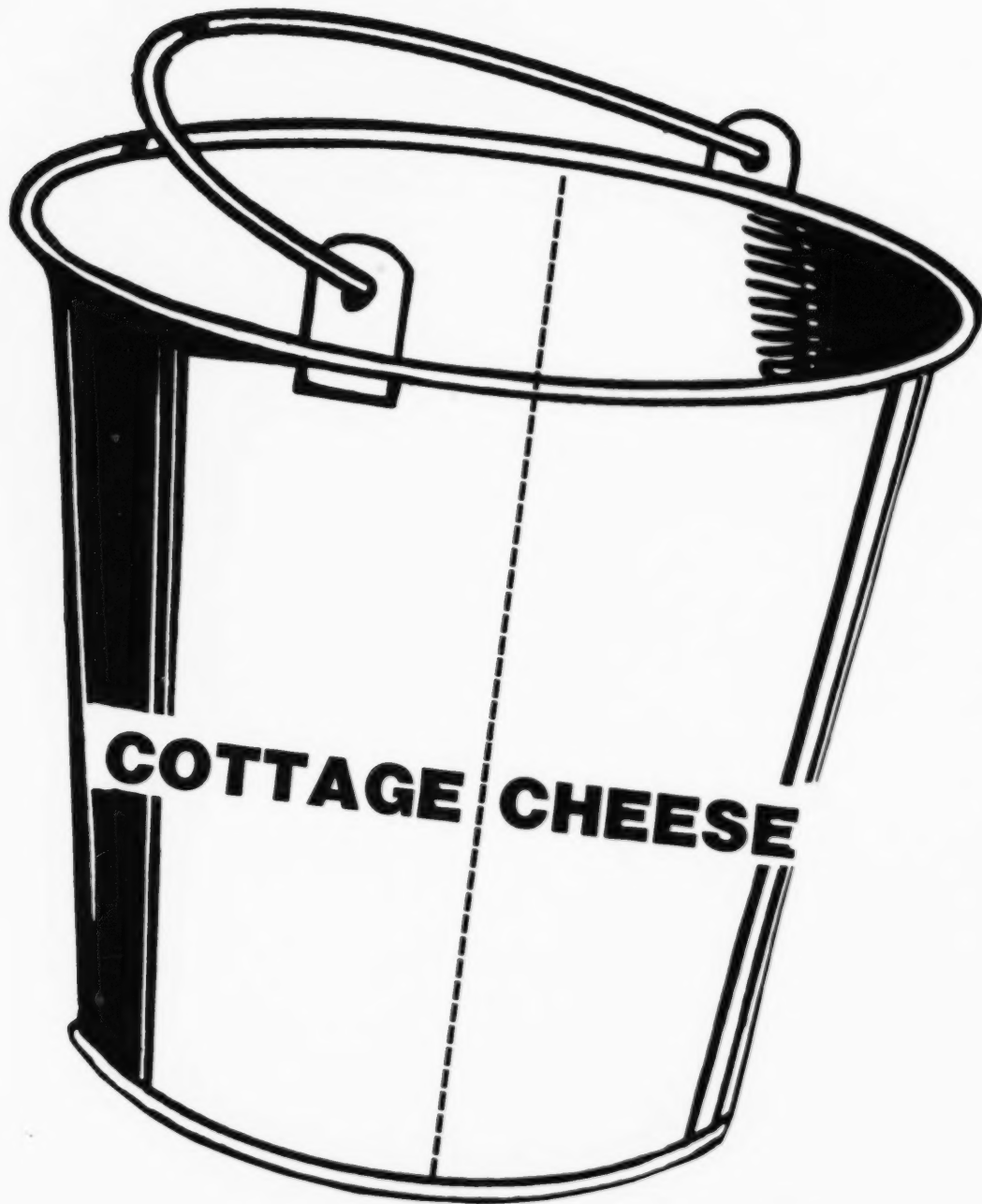
Activity Sheet



Spelling Milk Pails
Activity Sheet



Spelling Milk Pails
Activity Sheet



Spelling Milk Pails
Activity Sheet



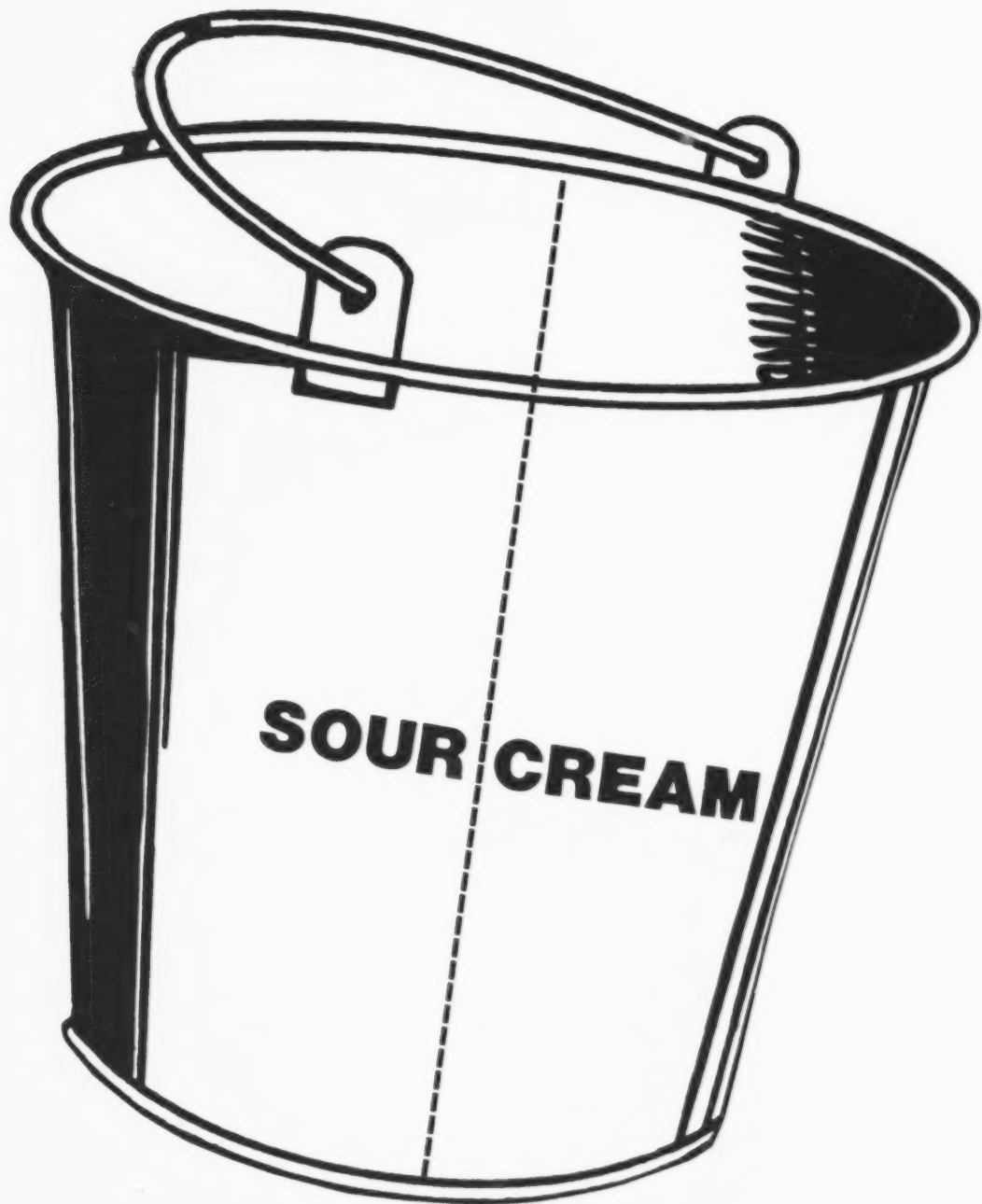
Spelling Milk Pails
Activity Sheet



Spelling Milk Pails
Activity Sheet



Spelling Milk Pails
Activity Sheet



Spelling Milk Pails
Activity Sheet



Subject Area: Math

Objective: The student will:

1. be able to compute story problems.
2. be able to gain some knowledge about a Nebraska product- soybeans.

Suggested

Grade Level: 3 - 4

Background:

The soybean is one of the oldest forms of nutrition in the world. The plant is an erect, bushy, leafy annual legume. It has been the most important legume in the development of the civilizations of China, Manchuria, Korea, and Japan.

The soybean plant first appeared in the United States in 1804, but it was not until more than 100 years later that this crop assumed agricultural importance. New varieties were introduced and a heavy demand for oil during two world wars brought about a tremendous increase in production.

Soybeans, with an average yield of about 31 bushels per acre, are grown primarily for the oil and grain products derived from the seed. The seed or grain has high nutritional value and is used in manufacturing many human foods. Each bushel yields 11 pounds of oil. The soy oil is utilized in commercial margarines, shortenings, vegetable and cooking oils. The soybean meal is used extensively for feeding livestock.

Resources:

Nebraska Soybean Board
301 Centennial Mall South
P.O. Box 94947
Lincoln, Nebraska 68509

Phone: (402) 471-4894

Materials:

1. Worksheet A and B.
2. Answer Key.
3. Tan construction paper.

Procedure:

1. Each student will cut out two pods and six soybeans, from Worksheets A and B. Glue the soybeans in the pod.
2. Students will complete each math problem.

Additional Activities:

Cooking Experience - Soynuts



Soak:

1 cup soybeans

2 tsp. baking soda

4 cups of water



overnight in the refrigerator. Boil one hour in same water. Good rule of thumb is to use 1 tsp. of salt per quart of water in soaking if you prefer.



Oven Roasted: Drain and air dry the boiled soybeans. Spread in a shallow pan. Roast in 350 degree oven for 30 minutes or until brown. Stir frequently during roasting process.

French Fried: Drain and dry the boiled soybeans. Pour oil in french fryer and heat to 350 degrees. Fry until lightly browned, season with salt.



Additional Activities:
(cont.)**Cooking Experience - Soy Oil Mayonnaise**

1 egg



1 tsp. Dijon mustard or 1/4 tsp. dry mustard



1/2 tsp. salt



1 Tbls. white wine vinegar or lemon juice



1 cup soy oil



Place egg, mustard, salt, lemon juice and 1/4 cup of the soybean oil in blender container. Cover. Blend on high speed for 30 seconds. While still on high speed, add the remaining 3/4 cup of soybean oil in a slow steady stream, scraping side of container frequently with a rubber scraper. Blend until smooth (about 2 minutes). Store covered in refrigerator. Serve with raw vegetables. Makes 1 cup. For best results, ingredients should be at room temperature.



1. It takes a farmer 2 hours to plant 15 acres of soybeans. How many acres could he plant in 4 hours?

2. A farmer made \$2,750.00 last year from his soybean crop. This year he made \$1,500.00. How much more profit did the farmer have last year?

3. A farmer grows 189 bushels of soybeans in his field, then pests destroy 62 bushels of soybeans before the farmer harvests the crop. How many bushels does the farmer have left?

4. A farmer plants 54 acres of soybeans on Monday, 26 acres on Tuesday (because the tractor broke down), and 49 acres on Wednesday. How many acres of soybeans will the farmer have planted by Wednesday evening?

5. A farmer has 287 acres of farmland to plant soybeans. A highway is built through his farm and takes up 25 acres of land. How much land does the farmer have left to plant soybeans?

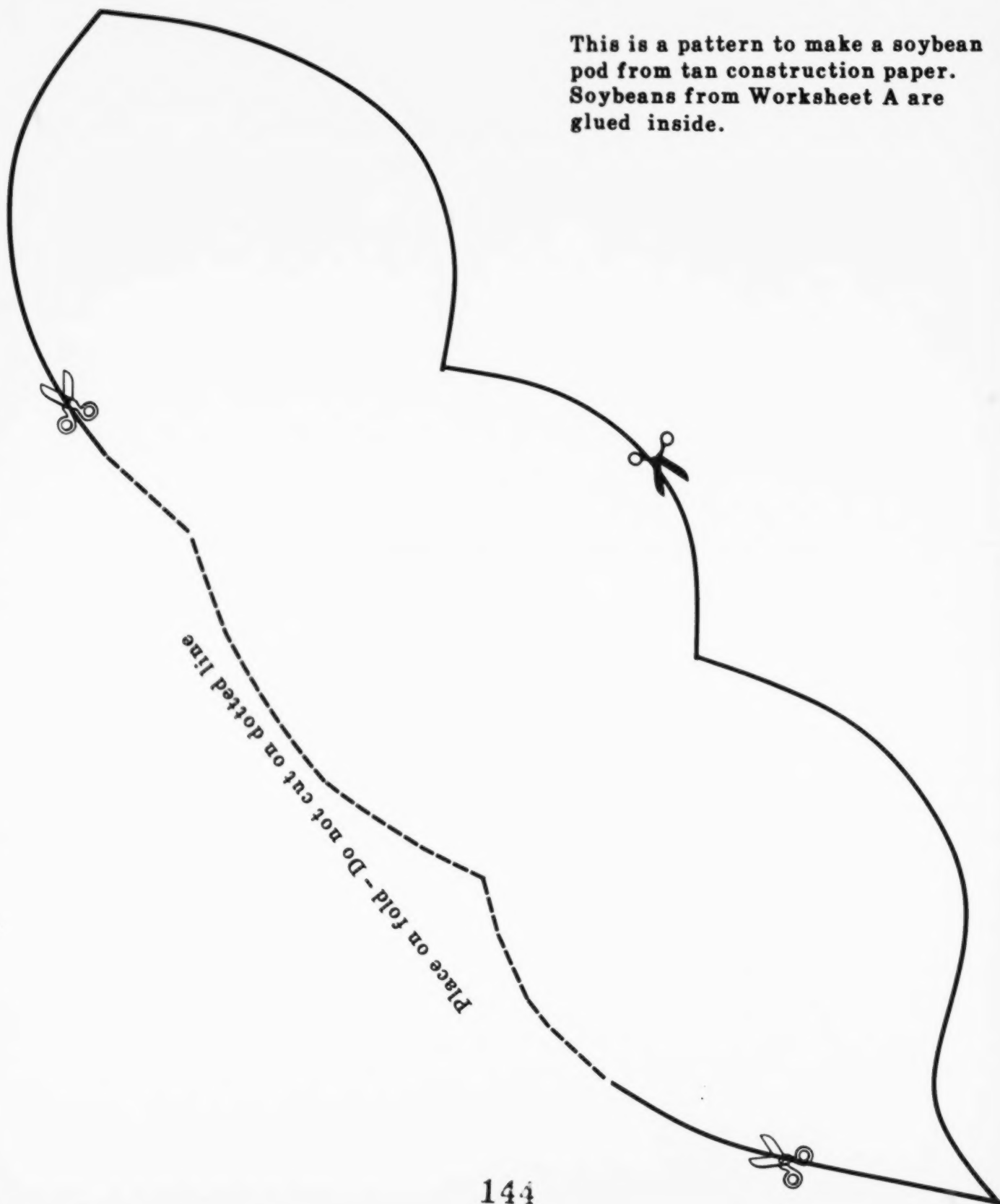
6. Each bushel of soybeans yields 11 pounds of oil. How many pounds of oil can you get from 4 bushels of soybeans?

Soybean Math

Worksheet B

Soybean Pod

This is a pattern to make a soybean pod from tan construction paper. Soybeans from Worksheet A are glued inside.



Soybean Math

Answer Key



1. 30 acres
2. \$1,250.00
3. 127 bushels
4. 129 acres
5. 262 acres
6. 44 pounds

Subject Area: Social Studies

Objective: The student will:

1. be able to understand what happens to wheat as it goes from the farm to the consumer and some factors that might affect the progress of this process.

**Suggested
Grade Level:**

1 - 3

Background:

Wheat makes a long trip before it becomes your breakfast toast. At the grain farm the farmer plants the wheat, waits until the wheat grows and turns to a golden brown color. He then harvests the wheat grain. The grain is sold to the grain elevator, where it is stored until it can be sold to the mill. The mill processes the grain into flour. A bakery will buy the flour to combine with other ingredients to make into bread or other products. The bakery sells the bread and wheat products to a wholesale distribution center. The wholesaler sells and distributes the bread and wheat products to a grocery store or restaurant, where these items are available to you the consumer.

Resources:

Nebraska Wheat Board
P.O. Box 94912
Lincoln, Nebraska 68509
Phone: (402) 471-2358

Materials:

1. "Wheat Game" Playing Board.
2. "Wheat Game Chance Cards" (cut them apart).
3. Dice
4. Two to four playing pieces (pennies, wheat kernels, or plastic pieces from another board game can be used).

Procedure:

1. To introduce the game, discuss with the class what happens to wheat as it goes from the field, to the elevator, to the millers, to the baker, to the store and to the consumer.
2. The game is designed for 2-4 players.
3. Place all the chance cards in the middle of the playing board. Each player selects a playing piece and rolls the dice to see who goes first.

**Procedure:
(cont.)**

4. The first to roll, rolls the dice and moves the correct number.
5. When you land on a loaf of bread, take a "chance card" and follow it's direction.
6. The first person "home" is the winner.

Additional Activities:

Cooking Experience - Popped Wheat

3 quarts water

1 quart clean wheat

Bring water to a boil. Add wheat. Cover and remove from heat. Let stand until swelled up (about 1 hour). Rinse with cold water. Drain thoroughly. This may take 45 minutes to 1 hour as there should be no water dripping from it.

Fry in shortening heated to 350 degrees until crisp and light brown in color. Drain on absorbent paper towel. Season with any flavored salt (onion, garlic, cheese or a combination of several of these) or plain salt.



Oops! The truck broke
down on the way to
the millers!

LOSE ONE TURN!

You forgot to eat any
wheat products today!
Oh No!

MOVE BACK 2 SPACES!

You can't buy bread
because the store is closed
during the holiday!

GO BACK ONE SPACE!

You helped mom
bake bread!

ROLL AGAIN!

Sale on bread!

**MOVE AHEAD ONE
SPACE**

Good crop this year!

MOVE AHEAD ONE SPACE!

The elevator is full!
MOVE BACK ONE SPACE!

The wheat is too wet to
take to the elevator!
GO BACK ONE SPACE!

The bakery is having a
special sale on bread!

ROLL AGAIN!

The combine broke down!
LOSE ONE TURN!

Flat tire on truck!
LOSE ONE TURN!

Mom fixed french toast
for breakfast!
ROLL AGAIN!

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

Bread is selling
fast at the store!

ROLL AGAIN!

A train arrives to load
out grain from the elevator!

MOVE AHEAD ONE SPACE

Great weather!

MOVE AHEAD ONE SPACE!

Harvest is delayed
one day due to rain!

MOVE BACK ONE SPACE

The flour truck is
caught in heavy traffic!

LOSE ONE TURN!

Very little traffic, grain
can be delivered on time!
MOVE AHEAD ONE SPACE!

The truckers run into
heavy traffic, grain delivery
is slowed down!
GO BACK ONE SPACE!

The elevator is selling grain
for a high price!
MOVE AHEAD ONE SPACE!

All your wheat is planted!
MOVE AHEAD ONE SPACE

Keeps raining, you can't
get in the field!
LOSE ONE TURN

Have you eaten any wheat
products today?
If you have-MOVE AHEAD
ONE SPACE
If not-LOSE ONE TURN

Baker bakes bread all day!
ROLL AGAIN

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

CHANCE CARD

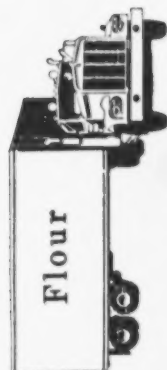
CHANCE CARD

CHANCE CARD

Start

The Wheat Game

The Farm



The Millers



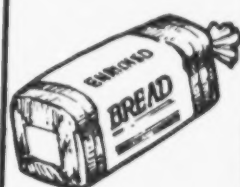
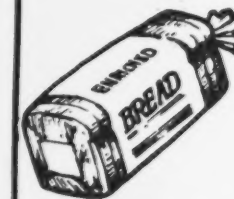
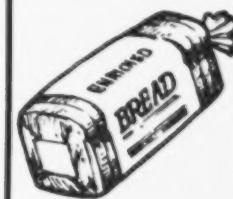
The Elevator

The Bakery



The Store

**Home
Mm!**



Nebraska's
Ag in the Classroom
Program

Ag in the Classroom --- **That Wonderful Beef** Program

Subject Area: Social Studies/Math

Objective: The student will:

1. be able to identify "cuts" of meat from beef.
2. be able to categorize cuts of beef.
3. solve math problems related to buying beef.

**Suggested
Grade Level:** 3 - 6

Background: Refer to enclosed poster chart on meat cuts from the National Livestock and Beef Board.

Resources: Nebraska Beef Industry Development Board
Rovar Park, Bldg. 1, Unit 1
East Highway 30
Kearney, Nebraska 68847-2408
Phone: (308)236-7551

Materials:

1. Poster Chart or transparency.
2. Worksheets A and B (C optional)
3. Activity Sheets A and B
4. Beef products (optional)
5. Grocery store advertisements

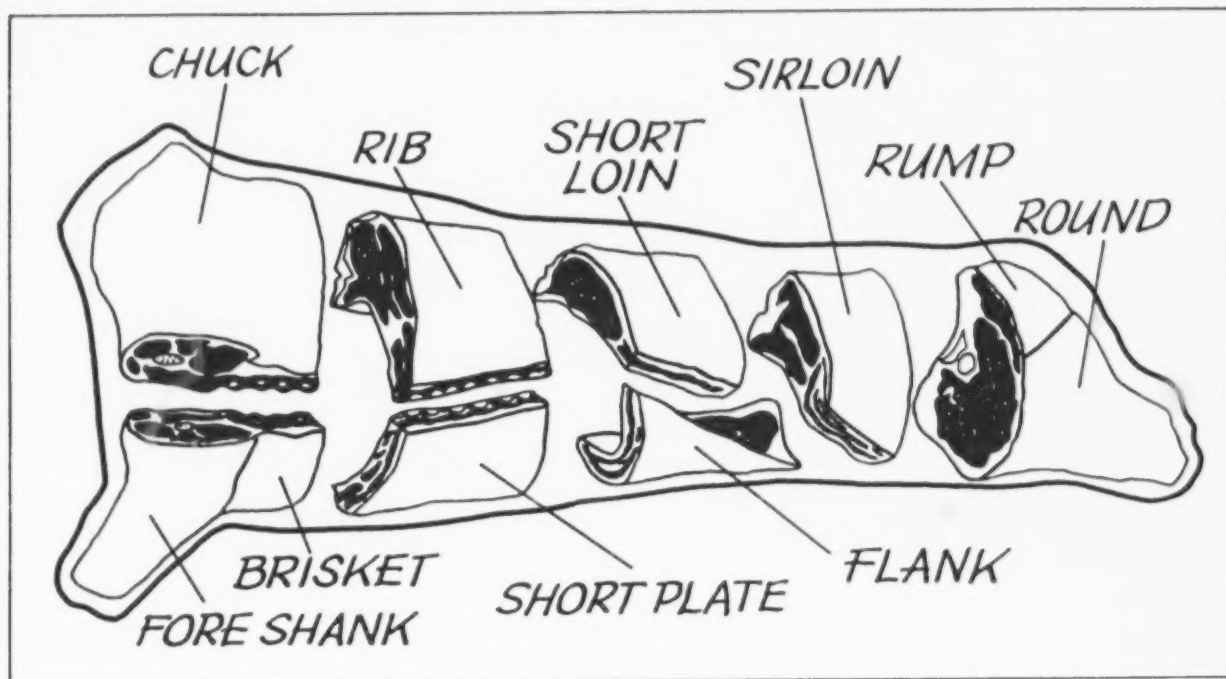
Procedure:

1. Display poster chart or a transparency made from Activity Sheet A.
2. For motivational purposes have some beef products available for the students to taste.
3. Begin the discussion with the students naming different cuts of beef. List these on the chalkboard. This information could be put on a graph.
4. Use the chart or transparency to show the students where each particular cut of beef is located on the carcass.
5. The students may work independently or as a class on Worksheet A. They are to label the parts of the beef. (Worksheet B can be used later as a review).

Procedure: — 6. Enlarge Activity Sheet B on poster board for display on a bulletin board. Have a variety of grocery ads available, one for each student. The student will cut out different ads on beef products. Put each one on the chart to show which area it came from on the carcass. Attach a piece of yarn to each section of the beef carcass to the ads pertaining to that section.

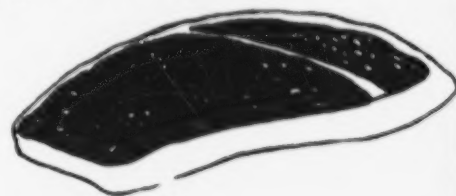
Additional Activities:

- A. **Worksheet C - Story problems related to purchasing beef in the grocery store.**
- B. **Visit the meat department at a local grocery store.**



Additional Activities:

(cont.)

C. Cooking experience - Beef Jerky**1 1/4 to 1 1/2 pound beef flank steak or top round steak****1 1/2 teaspoons salt****1/2 teaspoon garlic salt****1/4 teaspoon freshly ground black pepper**

Remove visible fat from steak; cut lengthwise (with the grain) into thin strips (1/8 inch or less, partially freeze steak to facilitate slicing). Combine salt, garlic salt and pepper; sprinkle over strips and mix to distribute evenly. Arrange 1/2 of the strips, flat and close together, on microwave-safe bacon rack. Cover with waxed paper and microwave at MEDIUM LOW 21 minutes; invert strips, placing drier strips in the center of rack, rotate rack 1/2 turn and continue microwaving at MEDIUM LOW 21 minutes until dry but slightly pliable. Remove to absorbent paper and let stand 24 hours. Store in a covered container.

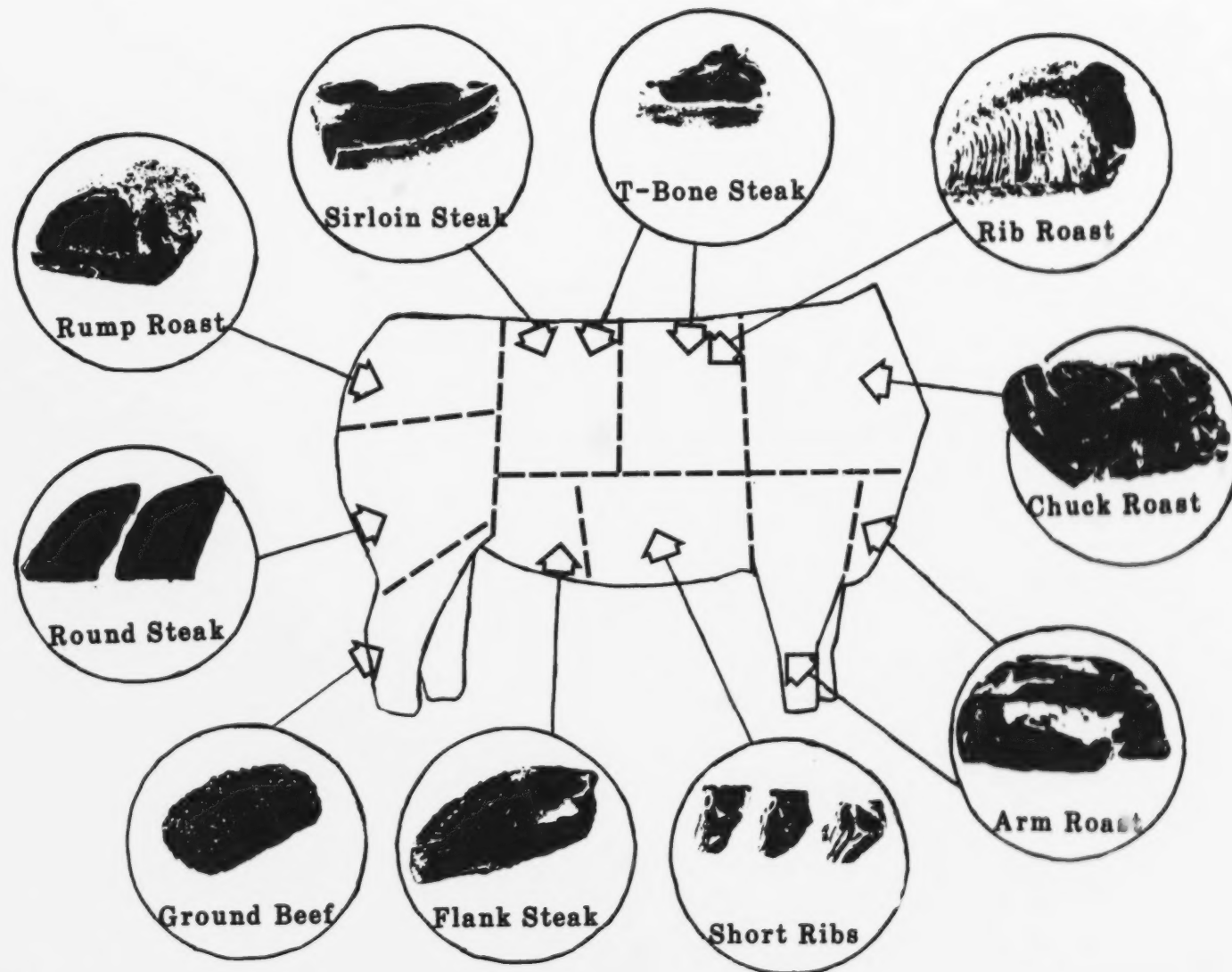
Note: The strips can be microwaved at MEDIUM 24 minutes or at HIGH 12 minutes. Quality is improved and strips are cooked more evenly on MEDIUM LOW power.



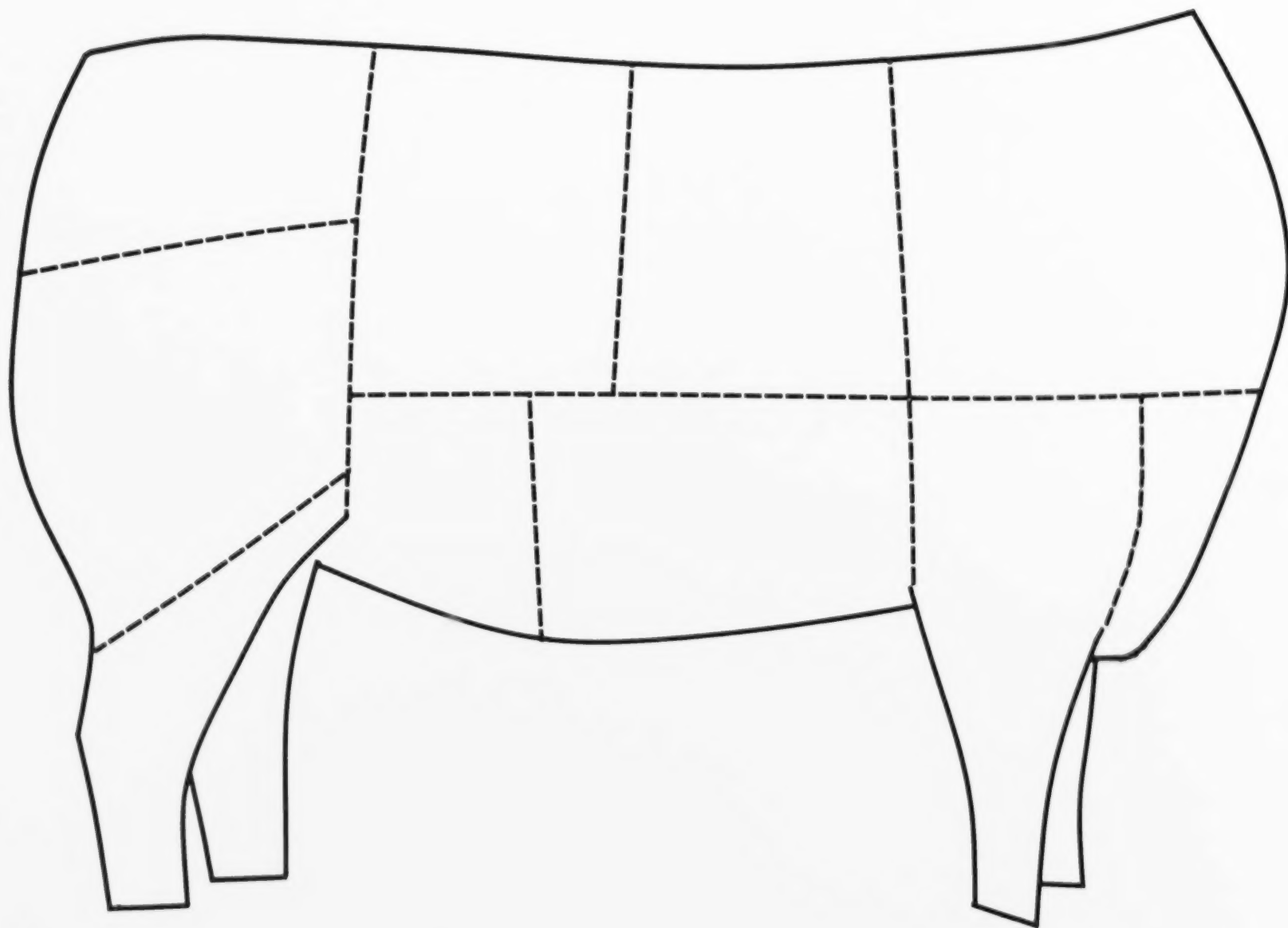
That Wonderful Beef

Worksheet A

Wholesale Cuts of Beef



That Wonderful Beef
Worksheet B



159

160

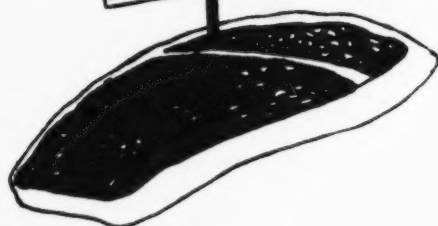
That Wonderful Beef Worksheet C

Sale Today

Hamburger



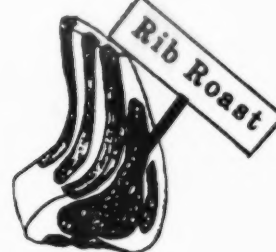
Round Steak



T-Bone Steak



Rib Roast



Chuck Roast



Now you are going to do some meat shopping.
Read and answer the problems below. Good Luck!

Prices per pound:

Chuck.....	\$1.10
Rib.....	\$1.84
Hamburger.....	\$1.25
Round Steak.....	\$1.35
T-Bone Steak.....	\$4.95

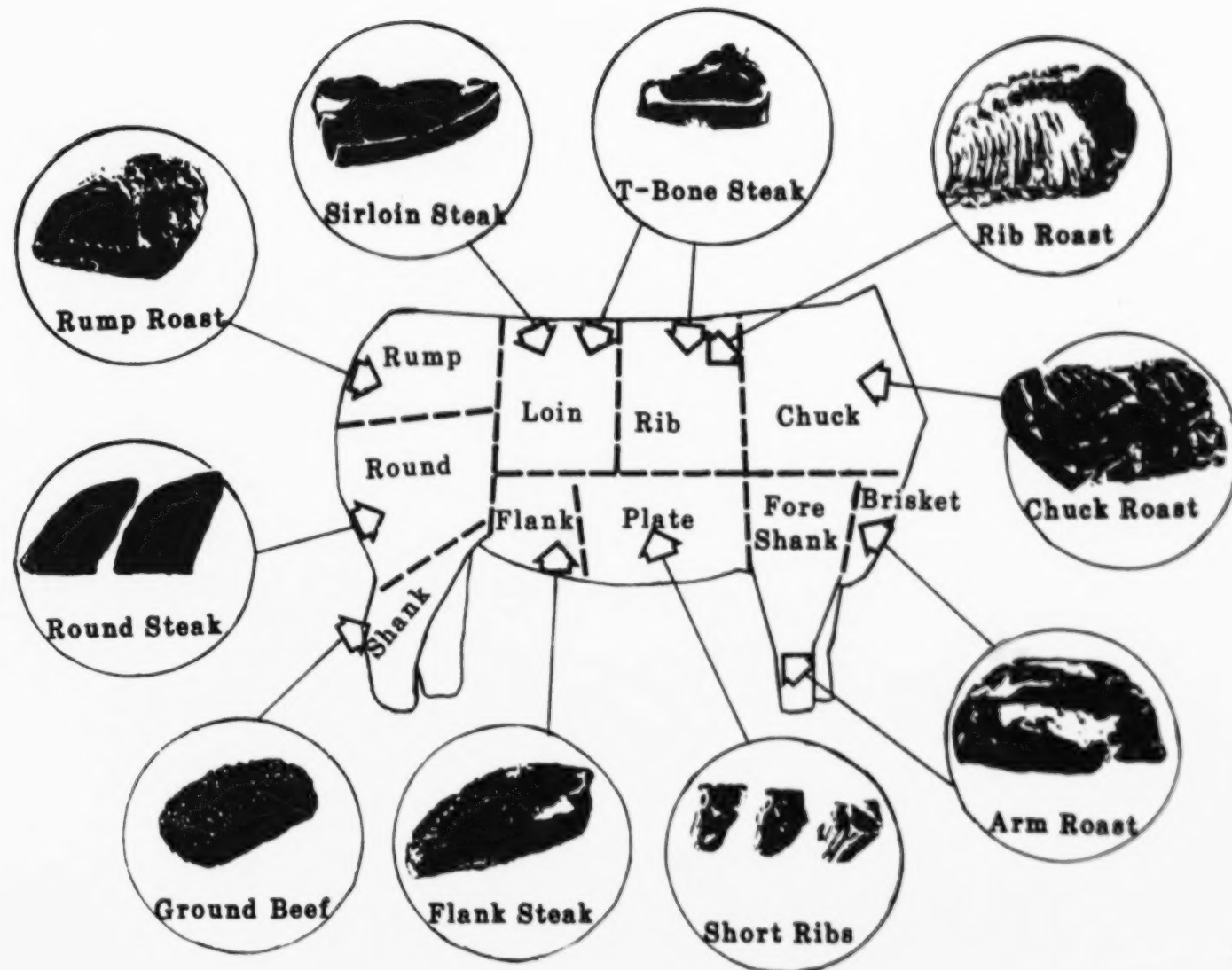
1. You have \$4.50, you need two pounds of round steak. How much change will you get back?
You will get back _____ in change.
2. Can you buy a four pound rib roast for \$4.00?
Why or why not? _____.
3. If you bought one pound of each kind of beef that is on sale today, what would your total bill be?
The total bill would be _____.
4. If hamburger costs \$1.25 a pound, and you went to the store and bought 3 pounds, how much money would you need?
You would need _____.
5. Two friends and you are having T-Bone steaks for supper. You have been elected to buy and cook the steaks. Each one of you wants a 1 pound steak. How much will this cost you?
Cost for each _____.
Total cost _____.
6. If you had \$7.00, how many pounds of chuck roast could you buy if roast is selling for \$1.10 per pound?
You can buy _____ pounds of chuck roast.
You will get _____ back in change.
7. You are now going to bake a five pound roast for supper tonight. The cookbook tells you to bake it for 50 minutes for each pound. How many minutes will you bake it? How many hours and minutes is that?
You will need to bake it for _____ minutes.
That is equal to _____ hours and _____ minutes.

Work Space

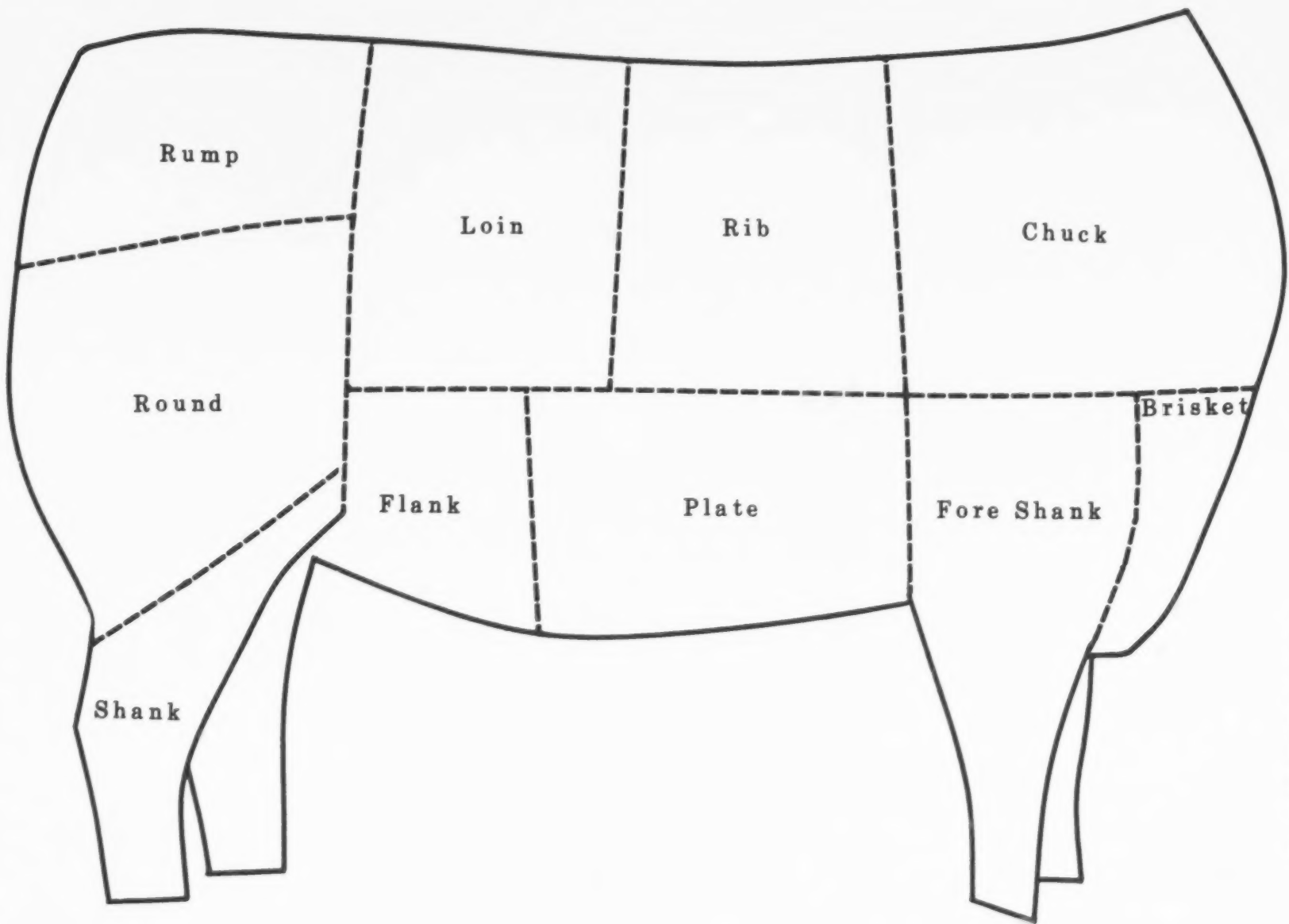
That Wonderful Beef

Activity Sheet A

Wholesale Cuts of Beef

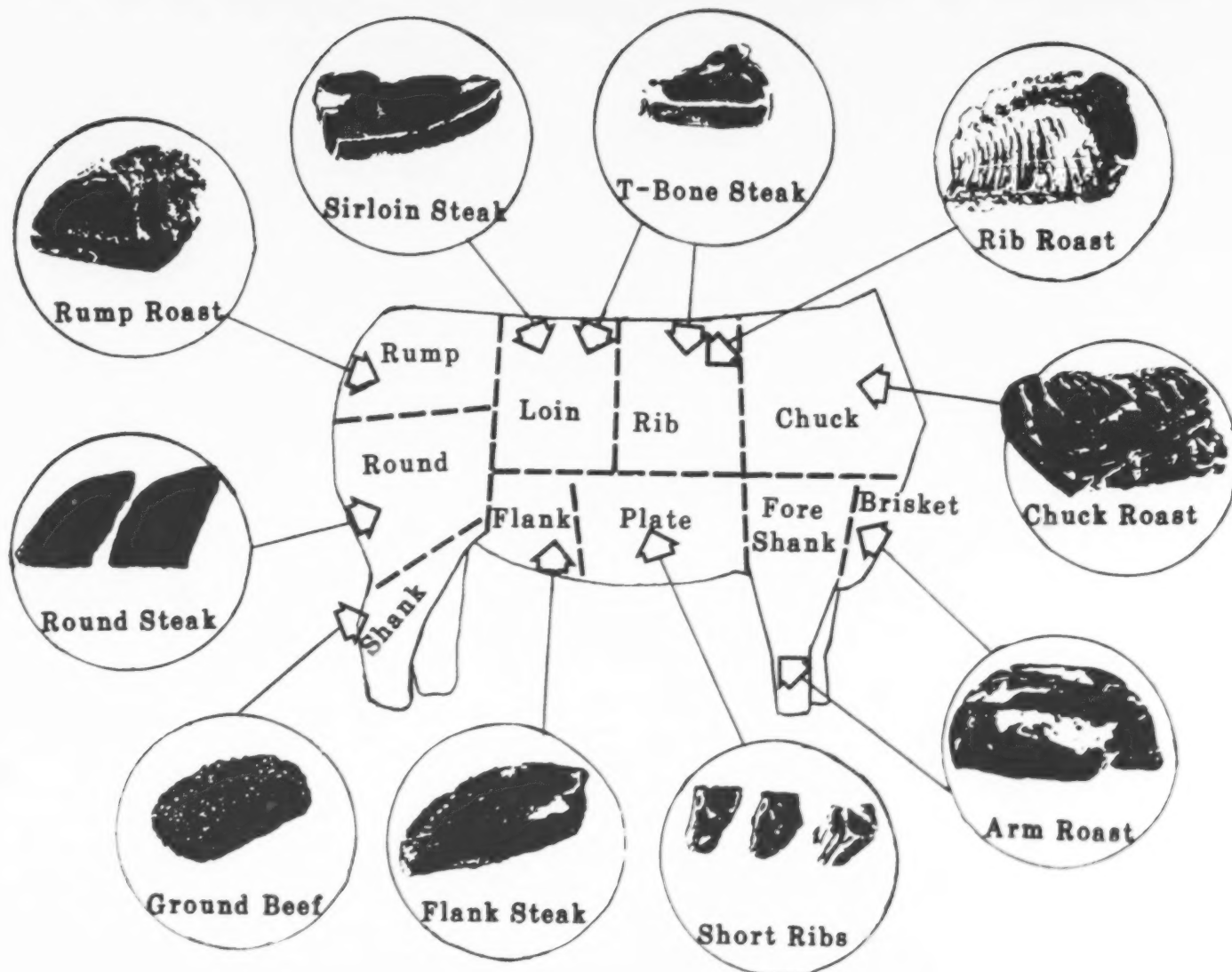


That Wonderful Beef
Activity Sheet B



That Wonderful Beef

Answer Key
Worksheets A and B



That Wonderful Beef

Answer Key Worksheet C

1. \$1.80
2. no, because rib roast costs too much.
Four pounds would cost \$7.36
3. \$10.49
4. \$3.75
5. \$4.95 (for each)
\$14.85 (for all three people)
6. 6 pounds
40 cents is your change.
7. 255 minutes
4 hours and 15 minutes

Library Books

1. Floethe, Richard and Louise. (1970) **Farming Around the World**. New York: Charles Scribner's Sons. Grades 3-6.
This is the story of the way people farm around the world. Farms supply us with our food we eat. On each page there is another farm in another land. Some are modern, while others are worked exactly as they were a long time ago.
2. Rockwell, Ann and Harlow. (1982) **How my Garden Grew**. New York: Macmillan Publishing Co. Inc.
This book tells the story of a child planting a garden and the different stages involved in growing plants.
3. Provinsen, Alice and Martin. (1974) **Our Animal Friends at Maple Hill Farm**. Random House Books. Grades K-3.
Maple Hill Farm has every farm animal imaginable. There are humorous lines in the story and many illustrations.
4. Marston, Hope Irvin. (1982) **Machines on the Farm**. New York: Dodd, Mead and Company. Grades 2-6.
Any modern farm needs machines to produce good crops. This book has the combine, which is the largest, and the tractor, which is the most important to the farmer. Other pieces of equipment are described.
5. Miller, Jane. (1983) **Farm Counting Book**. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. Preschool-Kindergarten.
The Counting Book uses farm animals to help the student learn to count and recognize numbers. The book is illustrated with full color photographs.
6. Demuth, Patricia. (1982) **Joel: Growing up a Farm Man**. New York: Dodd, Mead and Co. Grades 6-9.
Joel grew up on a farm and he wants to be a farmer. This book tells the story of Joel learning the skills of farming.
7. Olney, Ross. (1984) **The Farm Combine**. New York: Walker and Co.
The history of the combine is a fascinating story. The machines are traced from the earliest models to the giants of today.
8. Kushner, Jill Menkes. (1984) **The Farming Industry**. New York: Franklin Watts. Grades 6-9.
Farming is the most important occupation in the world, simply because we need food in order to live. This book covers 4 stages of the history of farming.
9. Bellville, Cheryl Walsh. (1985) **Rodeo**. Minneapolis, Minnesota: Carolrhoda Books. Grades K-6.
Calf roping, bronc riding, barrel racing — what do they spell? RODEO!! This book looks behind the scenes and shows readers what rodeos are all about. Clowns, competitors, and announcers are all included.
10. Benson, Christopher. (1974) **Careers in Agriculture**. Minneapolis, Minnesota: Lerner Publications Co.
People with **Careers in Agriculture** have a chance to work with both the science and the art of agriculture. This book describes the many careers available in the field of agriculture.
11. Mitgutsch, Ali. (1971) **From Grain to Bread**. Minneapolis, Minnesota: Carolrhoda Books, Inc. Grades K-3.
Highlights the step by step process of planting wheat seeds, harvesting the crop, grinding wheat into flour, and baking breads.
Other titles of Start to Finish books:
 From Seed to Pear
 From Sheep to Scarf
 From Milk to Ice Cream
 From Grass to Butter
 From Beet to Sugar
 From Cow to Shoe
Through simple illustrations and story lines, the reader will learn how a wide variety of common products are processed.

12. Bellville, Cheryl Walsh. (1984) **Farming Today, Yesterday's Way.** Minneapolis, Minnesota: Carolrhoda Books, Inc. Grades 3-6.
Today when we think of farming we think of tractors, combines, and other powerful equipment. On a farm in Wisconsin lives a family who still farms yesterday's way, using horses for power.
13. Andus, Rebecca. (1976) **Clover the Calf.** Minneapolis, Minnesota: Carolrhoda Books, Inc.
All the early morning noises of a dairy farm wake Sarah, who is visiting her grandparents for the summer. Sarah helps her grandparents with the milking of the cows and taking care of the newborn calves. Another feature of this book includes two pages of facts about cattle.
14. Bellville, Rod and Cheryl Walsh. (1984) **Stockyards.** Minneapolis, Minnesota: Carolrhoda Books, Inc.
The buying and selling of animals in a stockyard is a complicated business and a fascinating one. **Stockyards** explains the important steps between the time an animal is raised by a rancher and a piece of meat is placed on the dinner table.
15. Bellville, Cheryl Walsh. (1982) **Round-up.** Minneapolis, Minnesota: Carolrhoda Books, Inc.
Spring round-up is the busiest and most exciting time of the year on a cattle ranch. **Round-up's** clear explanations of this event will put you right in the middle of the action.
16. Bellville, Rod and Cheryl Walsh. (1983) **Large Animal Veterinarians.** Minneapolis, Minnesota: Carolrhoda Books, Inc.
Have you ever wondered what a country veterinarian does? Here's where to find out. The text and photographs describe procedures, equipment, and special problems faced by veterinarians who care for large animals such as cows, horses, pigs and sheep.
17. Jacobsen, Karen. (1981) **Farm Animals.** Children's Press.
Using photographs and large print, information is presented about farm animals in modern farm operations.
18. Olney, Ross. (1982) **Farm Giants.** Atheneum. Age 4 and older.
The "giants" pictured in this book are the huge pieces of machinery used on many farms for tilling, planting and harvesting.
19. Provensen, Alice and Martin. (1978). **The Year at Maple Hill Farm.** Atheneum. Age 4 and older.
In picture book format, the book follows farm animals through one year. Each animal's individuality is defined without giving it human qualities.
20. Isenbart, Hans-Heinrich. (1981) **Baby Animals on the Farm.** Putnam. Ages 3-9.
Large-colored photographs depict baby farm animals as they grow. Simple text comments on each animal's use with information, for example, "On many farms, calves are separated from their mothers and fed by the farmer."
21. Gibbons, Gail. (1985) **The Milk Makers.** Macmillan. Ages 3-9.
Bright illustrations combine with clear writing to make the book an attractive explanation of how milk is produced and distributed.
22. Lippincott, J.B. (1984) **Tractors: From Yesterday's Steam Wagons to Today's Turbocharged Giants.** J.B. Lippincott. Ages 8-12.
More than 50 black and white photographs make following the history of this basic farm machine easy.